STUDENT CHARACTERISTICS AND SITUATIONAL VARIABLES THAT RELATE TO RATINGS OF AIRCREW TRAINING

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DOCTOR OF EDUCATION
July, 1978

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VARIABLES THAT RELATE TO RATINGS

OF AIRCREW TRAINING

Thesis Approved:

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PREFACE

This study is concerned with student ratings of aircrew training. The primary objective is to determine what effect certain non-instructional variables have on the rating variance. It is hoped that the results of this study will provide a basis for interpreting student ratings of instruction within the 552nd Airborne Warning and Control Wing, Tinker Air Force Base, Oklahoma.

The author wishes to express his gratitude to Dr. John D. Hampton, chairman of the doctoral committee, for his guidance, counseling, and persistent encouragement throughout the program of study. Special appreciation is extended to Dr. David W. Perrin for his enthusiasm, advice and special counsel which made this study possible.

Special thanks are extended to Dr. James Yelvington for his frequent guidance, timely advice and suggestions throughout the program of study. Thanks are also extended to Dr. Kenneth L. King and Dr. Joseph H. Pearl for their invaluable assistance during this study.

Appreciation is expressed to Lieutenant Colonel Daryle S. Sadler, Lieutenant Colonel Howard T. Cariveau, Mr. Marvin R. Graham, and Technical Sergeant Ronald E. Boyle for their encouragement and frequent assistance during the program of study.

A special note of thanks is given to my wife, Laura, and daughters, Paula and Shannon, who sacrificed the most that this program of study might be complete. Finally, special appreciation is expressed for Keno, whose absence made the entire program of study possible.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE RESEARCH PROBLEM

Introduction

An integral part of instructional system management is the course evaluation process. The process encompasses a wide spectrum of evaluation activities, one of which is the elicitation of student attitudes about the instruction. Instructional systems design theorists such as Mager (1968), Kemp (1977), Briggs (1977) and Gagné and Briggs (1974) have written about the need and methods for obtaining student feedback, but they and other theorists generally ignore the issue of the validity of feedback data.

Numerous studies have been published concerning the validity and invalidity of student evaluation of instruction. Some of the more recent include those of Aleamoni (1976), Costin, Greenough and Menges (1971), Frey (1976) and Sheehan (1975). One recurring theme throughout these studies is that student characteristics tend to influence student ratings. Many of the investigations reviewed by McMilland (1976) and Costing, Greenough and Menges (1971) found that factors other than the quality of the course or instruction influenced student ratings. Furthermore, Pohlman and Elmore (1976) concluded from their literature review that student characteristics are often found to bias ratings of instruction.

One could conclude from these reviews that, in the management of instructional systems, administrators could more effectively use student ratings of instruction if able to identify and consider factors accounting for rating variance. Researchers who use such data should be concerned whether or not factors other than the quality of the course or instruction account for statistically significant portions of the rating variance (Aleamoni, 1976). Sheehan (1975, p. 688) noted that, "A variety of non-teaching factors affect student ratings and unless all of these factors are taken into account, the use of student ratings for evaluation decisions could be misleading."

The United States Air Force uses a systems approach in the development of its technical and flying training programs. As a part of the Air Force instructional systems development process, student opinion is used to help measure the instructional effectiveness and identify training program problems (Air Force Manual 50-2, 1975). In this regard, one study reported:

> The fact that student evaluation of course components is related to student characteristics provides educators with new strategies for understanding, evaluating and utilizing student feedback. Educators may now determine who is saying what about a given course (Weinstein and Bramble, 1971, p. 11).

Identification of characteristics or variables accounting for rating variance should therefore be considered in the evaluation of an Air Force instructional system.

Aircrew training for the Air Force's E-3A Airborne Warning and Control System (AWACS) is managed in accordance with guidance given in Air Force Manual 50-2 (1975). Instructional systems design principles are therefore followed, including use of student course evaluation

feedback. An analysis of the rating variance occurring on the E-3A course evaluations would be of value to the management of the E-3A AWACS training program.

Statement of the Problem

Data obtained from the Air Force E-3A AWACS Instructional Systems Analysis Student Questionnaire cannot be effectively used because the relationship between non-instructional variables (student characteristics and situational variables) and student ratings is not known.

Need for the Study

The identification of this relationship will place these ratings in perspective. This will allow E-3A AWACS training administrators to more effectively interpret evaluation data and thereby better manage the performance and direction of the E-3A aircrew training program.

Background and Significance of the Problem

The E-3A AWACS is an airborne surveillance and command and control aircraft for tactical and air defense forces. The system's aircrew training program consists of eight courses which train a crew of 17 airmen to perform in 12 different crew positions. An instructional systems development project begun in 1974 provides the training design and materials for the weapon system. A variety of course evaluation procedures are used in an attempt to satisfy the instructional system's need for evaluative student feedback (552nd AWAC Wing Regulation 50-7, 1977).

One procedure, the end of course critique, uses a questionnaire developed by the Training and Analysis Division of the 552nd AWAC Wing

Training Development Deputate. The questionnaire, "Instructional Systems Analysis Student Questionnaire," measures student attitudes covering seven distinct subscales. It also provides the division's only numerical data for training program evaluation. The questionnaire data are analyzed by training administrators for use in the management of the training program.

Course evaluation data such as that used in the E-3A AWACS training program can have a significant impact on training system management. Aleamoni (1976) noted that training evaluation information should be gathered on as many aspects of the instructional system as possible and from every source available. The value of student ratings over other course evaluation data is that they (1) provide feedback that cannot be obtained by observation, (2) establish norms against which other ratings might be compared, (3) provide a demonstration of instructional effectiveness, and (4) provide information on areas of relative strength and weakness in the overall program (Costin, Greenough and Menges, 1971).

Though student ratings have significant value, many investigators have cautioned users of this information. Hocking (1976, p. 315) claimed that "administrators who rely too heavily on these evaluations may be encouraging either grade inflation or developing a 'showbiz' type faculty." Also, using student feedback as a source of measuring instructor effectiveness would be a serious misuse of this information as a single measure of instructor merit (Guthrie, 1953). Another investigator, Curry (1976), further noted that student evaluations of instruction are a reflection of student expectations of class direction and instruction methods which sometimes are not what the course and instructor

should be doing. The results in such situations are often low evaluations.

Air Force use of student course ratings should therefore be accomplished with as much understanding as possible about the context in which the ratings are rendered. In the E-3A AWACS program this context is not clearly defined, and the training analysts and managers are less able to effectively interpret the evaluation data. When Treffinger and Feldhusen (1970, p. 622) found that student variables accounted for 21 percent of the criterion variance of student ratings of instruction in a certain situation, they concluded that "the student's rating of the course is a complex interaction of his initial feelings, certain cognitive and affective characteristics of teacher and pupils, and instructor performance."

The caution raised by many investigators and the reported influence on non-instructional variables on student ratings present the E-3A AWACS training administrators with a problem affecting the use of their course evaluation data. These administrators are faced with a dilemma. Ideally, for purposes of course evaluation, non-instructional variables would be held constant. This is unrealistic since good instruction in any given situation will affect students of varying backgrounds differently. Therefore, before course evaluation data can be confidently interpreted and applied to course management, the extent of non-instructional variable influence on student ratings must be identified. This study is an attempt to provide the information needed by these administrators to define this influence.

Basic Research Questions and Hypotheses

The research problem of this study specified a need to define the relationship between certain non-instructional variables and student course evaluation ratings. To solve the research problem, this study attempted to answer the following research questions:

1. Do certain student characteristics account for a significant proportion of the rating variance on the Instructional Systems Analysis Student Questionnaire or its subscales?

2. Do certain situational variables account for a significant proportion of the rating variance on the Instructional Systems Analysis Student Questionnaire or its subscales?

3. Do student characteristics and situational variables jointly account for a significant proportion of the rating variance on the Instructional Systems Analysis Student Questionnaire and/or its subscales?

To answer the basic research questions the investigator tested the following null hypothesis and its alternative:

H_o: There is no relationship between student ratings on the Instructional Systems Analysis Student Questionnaire or its subscales and certain student characteristics or situational variables.

H_1: Certain student characteristics and situational variables are related to student ratings on the Instructional Systems Analysis Student Questionnaire.

Limitations

This study was limited to six operational aircrews trained to

operate the E-3A AWACS aircraft. The sample was also limited to available operational aircrews receiving training during the period of March, 1977, through March, 1978. Research control was also limited by the managerial demands of a flexible and on-going aircrew training program (e.g., schedule changes, student availability for questionnaire administration, student aircrew assignment change, and student attrition).

Assumptions

To complete this study, the following assumptions were made:

1. The six operational aircrews used for this study were considered to be typical of the aircrew training population during this time period.

2. Students responded honestly to instruments used in this study.

3. The Air Force aircrew assignment process results in aircrews with members of similar backgrounds and qualifications within crew position, and that this assignment process will continue.

Definition of Terms

1. Operational Aircrew. Consists of 17 airmen who operate the E-3A AWACS aircraft in the accomplishment of its assigned missions.

2. Flight Crew. That portion of the operational aircrew having duties related to the flight functions of the E-3A aircraft. Crew positions include Pilot, Navigator, and Flight Engineer.

3. Mission Crew. Consists of E-3A AWACS aircrew members having

duties related to the communications, surveillance and weapons command and control functions of the aircraft. Crew positions include Mission Crew Commander, Senior Weapons Director, Weapons Director, Air Surveillance Officer, Air Surveillance Technician, and Radio Operator.

4. Technician Crew. Consists of aircrew members whose duties involve the on-board operation and maintenance of equipment supporting the mission function of the E-3A AWACS aircraft. Crew positions include Computer Display Maintenance Technician, Communications Technician, and Airborne Radar Technician.

5. Functional Group. The grouping of operational aircrew members in terms of their functional reponsibilities. The functional groups include the Flight Crew, Mission Crew and Technician Crew.

6. Non-instructional Variable. A variable which represents characteristics of students and situations rather than the quality of the course or instruction as measured by the Instructional Systems Analysis Student Questionnaire. Non-instructional variables may or may not be correlated with student ratings of course or instruction.

Summary

The E-3A AWACS Instructional Systems Analysis Student Questionnaire is an instrument which measures student attitudes on a wide range of E-3A training program materials and methods. The instrument's design and functions are consistent with those specified by Briggs (1977) for instruments used in an instructional systems evaluation effort. The questionnaire helps measure the effectiveness of the E-3A AWACS instructional system and is a functional part of the training program's system design.

Data furnished by instructional evaluation instruments should be interpreted with knowledge of the influence non-instructional variables have on student ratings. Since this knowledge is not available within the E-3A system, this study examined the certain student characteristics and situational variables which the literature indicates have accounted for rating variance and are common to the E-3A situation. The conclusions and recommendations resulting from this study should help E-3A training analysts and administrators interpret evaluation data and more effectively manage the performance and direction of the training program.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this chapter is to summarize literature which provides background information for the investigation. The findings of McMilland (1976) and Costin, Greenough and Menges (1971) provided the direction for much of this review. Their studies analyzed a large amount of the literature pertaining to the relationship of student ratings with student characteristics or situational variables.

McMilland (1976) reviewed 124 dissertation abstracts which assessed factors influencing student attitudes toward school subjects. The dissertations addressed levels of education from elementary school through the university. McMilland (1976) found that only 19 percent of the studies reported a significant influence of the instructional approach on student attitudes concerning instruction. He concluded that non-curriculum related variables may have as much, if not more impact on attitude formation.

> In summary, a review of recent dissertations confirms other research to suggest that the factors which have an impact on student attitude development toward school subjects reside with the teacher and student and not with the curriculum or instructional approach (p. 325).

Costin, Greenough and Menges (1971) reviewed numerous investigations concerning the relationship between student variables and ratings of

instruction. They reported finding contradictory evidence for significant relationships. In 16 studies they found no relationship between expected or actual grades and student ratings of instructors, while in 12 studies they found weak but "significant positive relationships between students' grades and their ratings of instructors and courses" (p. 518). The authors attributed this conflict partially to student achivement motives. They also reported finding similar conflicts pertaining to the elective classification of the course, student standing, and class size. Their conclusion was that "students are at least partially capable of distinguishing certain qualities of instruction which increase their knowledge or motivation" (p. 514).

The above two studies demonstrated that student ratings and student characteristics or situational variables relate to each other in some circumstances. That these relationships are situationally operant was suggested by Sheehan (1975, p. 689) when he stated that "for every student rating scale and for every population of students all of the non-teaching factors which cause variation in the world have to be isolated." Though the number of variables and type of analysis studied in any of the reported investigations may be sources of invalidity, the literature does "convey the message that some individual characteristics may influence students' perceptions of instruction" (Scott, Halpin and Schnittzer, 1974, p. 7).

This chapter will summarize literature based on the implications of the above cited studies. A review of instructional system design theorists and investigators concerning the need, use and reliability of student ratings of instruction is followed by a review of investigations

focusing on student characteristics and situational variables relating to the student ratings.

Evaluating the Instructional System

The importance of evaluating the instructional system is well documented. Doll (1970) emphasized the importance of involving all educational system participants in the evaluation of the curriculum. The evaluation process, however, involves many activities. Some of these activities include measuring student performance, analyzing student behaviors, observing learning activities and obtaining student feedback. Gagné and Briggs (1974) defined two aspects of the evaluation process which are commonly found in an evaluator's dictionary: formative and summative evaluation.

During formative and summative evaluation, measuring student attitudes about the instruction system or its components is instrumental to a successful evaluation. The kinds of data available during these types of evaluation come from an observer, the instructor or the student. During the formative evaluation process Dick (1977a) argued that

> . . . it is quite common to employ attitude questionnaires in the formative evaluation process. It is desirable to have students indicate their specific reactions toward the instructional method as well as the content which they have received (p. 318).

Though formative evaluation usually occurs during the development of the instructional system, summative evaluation is conducted after the system is designed or is in full operation. Gagné and Briggs (1974) noted that summative evaluation differs from formative evaluation (when considering the student attitude questionnaire) by the careful design of the questionnaire. During summative evaluation, the questionnaire

is more carefully constructed to allow the evaluator the opportunity to compare student responses with previous or subsequent ratings (Gagné and Briggs, 1974). This difference, the need for developing questionnaires more in accordance with sound psychometric principles, was also supported by Dick (1977b) in his review of the summative evaluation process.

The issue often facing system evaluators, however, is the question concerning the need for using student information about the instructional system. This question was answered by Doll (1970, p. 286) when he stated that "children and youth may be said to be the consumers in the education process. As such, they deserve to be consulted at intervals as teachers plan with them." Gagné and Briggs (1974) also addressed this issue by explaining that, during the evaluation of the instructional system, many variables are "support" variables which include individual differences and backgrounds. While controlling these variables in the case of students is most difficult, student participation in the system is unique and warrants the investigator's interest in the student's reactions to the instruction.

Other system design theorists have also commented on the need for student ratings of the instructional system. Kemp (1977) included evaluation as a major component of his instructional systems design model. During formative evaluation he asks the student for his reaction to the methods of instruction, while during the summative evaluation process he measures the student's attitudes about the subject, the method of study, the activities, and his relationship with the instructor and other students (Kemp, 1977). Mager (1968) supported the inclusion of student ratings of instruction and even offered questionnaire design techniques. And Popham (1973) cited the importance of student

feedback during the information-decision making process of instructional system evaluation.

The Air Force prescribes use of student feedback in evaluating the effectiveness of the instructional system. Air Force Manual 50-2 (1975) identifies internal and field evaluation processes as essential steps in the design of an instructional system. During field evaluations, the questionnaire can be valuable for obtaining evaluative student feedback. Many Air Force commands, such as the Tactical Air Command, require students to critique the instructional system during and at the end of instruction for a more thorough analysis of training program effectiveness (Tactical Air Command Regulation 50-31, 1975).

Evaluators value the use of student attitudes concerning the instructional system. Opinions are usually obtained through questionnaires and are sought in such a manner that student responses will enable evaluators to take some action. One text stated that student opinion "offers another useful way of judging instructional effectiveness" (Davis, Alexander and Yelon, 1974, p. 113). The value of this feedback, however, is often questioned by training administrators and instructors.

Administrator use of the student ratings is an issue many investigators have examined. Sheehan (1975) noted that use of these ratings depends on their interpretation in conjunction with other measures. Kulik and McKeachie (1975), however, took a more critical look at the ratings and noted that their use by administrators was basically for faculty evaluation. For instructors, Kulik and McKeachie (1975) said that

> . . . student ratings do not provide feedback. The metaphore of the homeostat suggests an integrated system in which performance is continually monitored and adjusted according to the information that is fed back. Student ratings may be too global, too judgmental, and too anonymous to have an impact on practice (p. 225).

Hocking (1976) was likewise less than enthusiastic about the use of student ratings of instruction. Besides his comments concerning grade inflation and the "showbiz" type faculty that may result, he noted that the more emphasis placed on student evaluation in salary, retention, and promotion, the greater the chance of lowering the instructor's academic standards to retain his job. While Hocking (1976) and other authors presented a negative view on the use of student ratings, other investigators have noted their value in the management of the instructional system.

Costin, Greenough and Menges (1971) and Davis, Alexander and Yelon (1974) clearly cited the value of instructional ratings. The more apparent values include the uniqueness of the feedback, demonstration of instructional effectiveness, norms for other personnel ratings, and indication of weak and strong areas in the system. Also valuable is the information the ratings provide about how the instruction affected the students, the student view of the learning experience, and the opportunity to ask the student questions which lead to specific courses of action for improving weak areas of the instructional system. Students who are afforded the opportunity to participate in the design or revision of the instructional system through questionnaires and critiques are more genuinely interested in the instructional program and tend to offer more practical and valuable suggestions. Though student ratings can serve as feedback to instructors leading to improvement in teaching,

"only to the extent that the teacher understands and accepts the student's ratings will they result in any improvement of teaching" (Guthrie, 1953, p. 221).

Though student ratings have some value for revision of instruction and administrator evaluation of the staff, the more significant value is in the design and direction of the entire instructional system. The use of student ratings for instructor management and instructional system improvement could be more knowledgeably accomplished, however, if factors biasing student ratings are measured and accounted for (Pohlman and Elmore, 1976). In so doing, the consistency and stability of student ratings become issues many educators raise.

Costin, Greenough and Menges (1971) reported in their review that in 10 studies internal consistency correlations ranged from .69 to .94, and that three studies showed stability correlations between .67 and .89. "It would appear, then, that students can rate classroom instruction with a reasonable degree of reliability" (Costin, Greenough and Menges, 1971, p. 513). Frey (1976) measured student attitudes about an introductory calculus class at a major university. One half of the students critiqued the instruction the last week of class, the other half critiqued it the first week of the next academic quarter. The investigator found that the ratings made at two different times were not different, and that both sets of ratings correlated positively with the final exam performance--the latter ratings showing stronger relationships. "In summary, therefore, the analysis of variance indicated that . . . the time of data collection (before the exam vs. after the exam) did not significantly affect the ratings" (Frey, 1976, p. 332).

The stability of ratings over a longer period of time was investigated by Kohlan (1973). Examining student attitudes toward faculty in a selected university course, the investigator gave questionnaires to students during the second and last hours of instruction. Results indicated that students formed attitudes early which remained stable throughout the course. Kohlan (1973) reported a product moment correlation of .58 between student ratings obtained during the second hour of instruction and last hours of instruction. "Students early evaluations are quite stable and instructors should be aware that the first few days of class may be very important in determining the eventual image students evaluate at the end of the course (Kohlan, 1973, p. 594).

McCollister et al. (1975) conducted a longitudinal study of response stability. The study involved 167 freshmen at a major university who rated a course during their first semester and reevaluated it during their senior year, three years later. The investigators reported that "the aggregate data . . . suggests that the overall student evaluation given to an instructor and his course does not significantly alter over time" (McCollister et al., 1975, p. 9).

The importance of student ratings in evaluating the instructional system is well recognized by theorists. The value and use of these ratings, however, seem somewhat clouded by the misinterpretation of the context in which the ratings occur and how they should be used and interpreted by administrators and instructors. Some investigators and theorists have identified the value and use of the ratings for instructors, administrators, and evaluators, assuming the user's willingness to use the information and the identification of variables creating student rating bias. The tendency for high rating stability and consistency

enhances the value of the ratings for all users, especially the system evaluator. The context in which the ratings are given (as defined by the student characteristics and situational variables) will now be addressed by this literature review.

Student Characteristics

The literature pertaining to the student characteristic and student rating relationship is extensive. Since most research on student characteristics is conducted in secondary and higher education, research findings must be generalized to this investigation. Many E-3A student variables differ in terminology from those found in the literature, but have distinctly similar relationships to the training situation in which they are found. Student characteristics reviewed in this chapter (with corresponding E-3A student characteristics indicated in parentheses) include the following: Age of Student (Age of Student); Previous Student Study (Years of Active Military Service, Years Experience in Related Duties); Student Social Status (Paygrade); Ethnic Group Membership (Ethnic Group Membership); Elective Course Enrollment (Volunteer Status); Student Education Level (Education Level); and Student Achievement (Promotion Eligibility, Satisfaction with Training, and Standardization/ Evaluation Scores).

Age of Student

Many studies have reported on the relationship between the student's age and his ratings of the instruction. A research review by Sheehan (1975) reported four studies reflecting a variation in ratings as a

result of age. Lumsden (1973), who analyzed student evaluations of faculty and courses at a major university, also reported that the older a student was, the higher he rated the instructor overall. In an earlier study, Walker (1969) investigated selected student variables and student evaluation of teacher effectiveness at a community college. Using a large sample (n = 1447), Walker found that the older student tended to rate teachers higher than did the younger student.

In discussing individual differences in the "philosophy of human nature" (PHN), Wrightsman (1974) reported that peoples' PHN differed over several subscales. For the subscales of trustworthiness, altruism and complexity, he stated that research was consistent "in finding college students have less favorable beliefs about human nature than do older adults" (Wrightsman, 1974, p. 99). The results of the Lumsden (1973) and Walker (1969) investigations would seem appropriate in view of the Wrightsman report. The implication is that the older students tend to rate instruction more favorably than younger students.

Previous Student Study

While investigating student attitudes toward the study of a foreign language at the community college level, Hall (1977) found no significant differences in attitudes toward foreign language study between students who had previous language experience and students who had none. Palmer, Carliner and Romer (1975), while measuring the effects of leniency and learning on student evaluation of teaching effectiveness in university economics courses, found that previous knowledge of economics had no influence on student responses to the study's questionnaire.

A study by Haslett (1976), however, produced evidence that student ratings were influenced by student experience. Haslett investigated the interactions and influence of several student characteristics on student ratings of various instructor and course variables. Three different university class levels were involved in the study (introductory, intermediate, and graduate). Student knowledgeability about the material before study was one of the characteristics. Haslett (1976, p. 59) reported finding that "the higher the level of student's knowledgeability, the higher the student's ratings of his instructor's competency and effectiveness. The investigator also reported that student knowledgeability accounted for 22 percent of the variance in overall course and instructor ratings and that when combined with class size, these two characteristics became the main predictors of student ratings in the multiple regression analysis.

These three studies address differing types of student experience in different settings. The Haslett (1976) findings suggest a relationship between experience and student ratings, while the Hall (1977) and the Palmer, Carliner and Romer (1975) studies suggest not. In his review, Sheehan (1975) concluded that the influence of student characteristics may vary with rating scale and situation. The studies cited suggest such a relationship.

Student Social Status

In an early study, Sherif, White and Harvey (1955), formed an experimental group of 12 year old boys of the upper middle class to study the relationship between group status and estimates of peer performance. Their results showed that "the performance of members of

high status was over-estimated; the performance of members of low status was under-estimated, the extent of over- or under-estimation being positively related to status ranking" (Sherif, White and Harvey, 1955, p. 379). In a study by Koslin et al. (1968), boys at a boys' camp tended to provide higher estimates of another group member's performance the higher on the sociological scale the member appeared. An earlier study investigating cliques at a major southwestern university reported that the higher the status of an individual in the clique, the greater the tendency of other group members to overrate the individual's performance; and conversely, the lower his group status, the less likely he would be overrated by other group members (Harvey, 1953).

These studies demonstrate that social status can be a factor in rating peer performance. By viewing military personnel as having single group membership (military students and military instructors alike), these studies suggest that military rank might influence student ratings of instructors.

Ethnic Group Membership

Most literature pertaining to ethnic group membership focuses on the black vs. white issue. Wrightsman (1974, p. 98) stated that "blacks see human nature as less trustworthy than whites do. Further research indicates that, when blacks respond to statements about 'most people,' they are thinking of whites." Wrightsman (1974) reported that in two cases, a private middle class black university and a land-grant state university, blacks shared a distrust in human nature. These findings suggest that black students may be more critical of instructional systems than whites.

Three studies demonstrated a difference in black student attitudes concerning instruction in comparison with other racial/ethnic groups. These differences, however, were not all in the same direction. Goodwin (1975) studied the attitude of 19,236 school students toward a major city's school system (grades 7 through 12). Goodwin (1975, p. 4905) found that "(1) blacks, females and seventh graders had the highest positive perception of liking school; (2) blacks, females and seventh graders had the highest perception of interest in learning." In another secondary school study, Miller (1975, p. 6945) reported that, concerning selected teacher personality traits, "when race was a factor, the student in all situations--both blacks and whites--tended to disagree less with a trait deficiency among teachers of their own race, than students of another race." And a third study, focusing on the post-secondary school level, reported black students from inner cities who entered post-secondary schools were critical particuarly of course relevancy (Ward, 1969). These reports suggest that race may account for differing student attitudes concerning instruction.

Elective Course Enrollment

Investigators reporting the relationship between student ratings and the elective status of a student's course of instruction have found conflicting evidence. Costin, Greenough and Menges (1971) did not find in their literature review evidence that the elective status of a course was an influence on student ratings. A later study (Haslett, 1976) also reported that high instructor ratings were not apparently related to the elective status of a course.

Some studies, however, have found a relationship. In one such study, instructors of elective courses were found to receive higher rankings than did instructors of required courses (Gage, 1961). A more recent study on college students' evaluations of faculty also revealed that "whether a course is required or elective has an effect on the evaluation" (Hocking, 1976, p. 315). These two studies conflicted with others cited, again indicating that student characteristics may relate to student ratings depending on the course situation or rating scale. Whether or not a student who volunteers for a course of instruction and favorably rates the course or instructor because of his volunteer status is an issue not clearly resolved in the literature.

Student Education Level

Conflicting evidence also exists concerning the relationship between a student's education level and his ratings of instruction. The Costin, Greenough and Menges (1971) study reported this conflict based on literature concerning the correlation between undergraduates and graduates ratings of instruction. Some of the findings were significant, some were not. While three other investigations reported no significance concerning this variable and course evaluation (Walker, 1969; Palmer, Carliner and Romer, 1975; and Pohlman and Elmore, 1976), other recent investigations demonstrated a relationship.

In a study involving the administration of course evaluation questionnaires over a period of six years to 4,555 course sections at a midwestern university, Aleamoni and Graham (1974) reported finding highly significant differences in ratings assigned by students in freshman, sophomore, junior, senior and graduate level courses. Frey,

Leonard and Beatty (1975, p. 443), in a study involving three different universities, reported direction in the rating differences when they stated "there is a reliable trend for the more senior students to give higher ratings to their instructors." Haslett (1976) and Lovell and Haner (1955) also reported class level significantly influenced ratings of instruction, with advanced classes rating more favorably.

One study, however, found a negative direction. Centra and Linn (1976) found that lowerclassmen rated higher course examinations, course quality and to a less extent, test factors. The results of this study, however, appear inconsistent with the majority of studies finding significant positive correlations between educational level and ratings of instruction. That a relationship exists between this student characteristic and student ratings of instruction, however, remains unproven. Also, the Centra and Linn (1976) study demonstrated that the correlation between these variables may be in either direction, suggesting a situational or rating scale influence.

Student Achievement

A large number of studies have examined the relationship between student achievement and course evaluation ratings. The review of literature by Sheehan (1975) reported positive and negative correlations between student achievement and instruction ratings. In their extensive review of studies on this subject, Costin, Greenough and Menges (1971, p. 518) reported that 16 studies found "no relationship between students' ratings of instruction and their expected or actual grades in a course," but 12 other studies found "significant positive relationships between students' grades and their ratings of instructors and courses."

Research since the publication of the Costin, Greenough and Menges (1971) study reveals a large amount of evidence suggesting a relationship between student achievement and course ratings. One study found a negative relationship between these two variables. Rodin and Rodin (1972) reported that undergraduates (n = 293) in a calculus course rated highly those instructors from whom they learned the least. Several subsequent studies, however, were unable to replicate the Rodin and Rodin results. Frey (1973), for example, found a positive correlation as did Sullivan and Skanes (1974).

Numerous other studies have produced positive correlations between achievement and course evaluation. Lumsden (1973, p. 56), in a study of 4996 graduate students at a major western university, found that the student's expected grade was significant in explaining his course evaluation: "an extra point on the course evaluation scale was worth 2.5 points on the final essay exam." Frey, Leonard and Beatty (1975) found in their study covering three different universities, that student accomplishment correlated with instructor ratings. And Hocking (1976, p. 315) reported that "the evaluation of the course, and the student's interest in the course is a direct function of his grade expectation."

"Students tend to give higher ratings to teachers who teach courses which students believe to be fulfilling their needs" (Walker, 1969, p. 3474). Students tend to be grade motivated. Grades represent an evaluation of performance and therefore create an achievement situation. According to Atkinson, an achievement situation is any situation in which a person

> . . . knows that his performance will be evaluated (by himself or by others) in terms of some standard of excellence

> and that the consequence of his actions will be either a favorable evaluation (success) or an unfavorable evaluation (failure) (Arkes and Carske, 1977, p. 202).

Even the self-actualizing student may be motivated by external incentives to learn, such as grades (O'Brien, 1974). Student needs may therefore involve the achievement of grades, and instructors who fulfill these needs may tend to receive the higher evaluations from the student.

> The possibility exists that subjects who have a higher need for academic achievement and achieve high grades see instructors as having greater S^D value [Discriminative Stimulus--the instructor is a conditioned reinforcer] and rate them accordingly (Weinstein and Bramble, 1971, p. 11).

The literature tends to indicate that in most instances students' expected grades do correlate with course ratings.

> The positive findings that do occur might better be viewed as a partial function of the better achieving students' greater interest and motivation, rather than as a mere contamination of the validity of student ratings (Costin, Greenough and Menges, 1971, p. 519).

Though this may be explained by situational factors and rating scale differences, course administrators should look for a relationship between ratings and student achievement until varified otherwise.

Student characteristics are frequently found to be related to student course ratings. The relationship, however, tends to vary with the situation. One investigator's advice to examine all student characteristics for every learning situation is amply supported by the literature. Instructional systems evaluators should therefore assume student characteristics influence course ratings, at least until they have investigated the relationship between these two variables for each situation in which students rate instruction.

Another set of variables that are not student generated but still potentially influencial in the evaluation of instruction are the

situational variables. These non-instructional variables frequently correlate with student ratings and should be considered along with student characteristics in any investigation of the relationship between non-instructional variables and course ratings.

Situational Variables

A variety of situational variables are often found to influence student ratings of instruction. Though these variables differ among students, they are not characteristics of the student but situations of the training environment in which the student becomes a participant. As with student characteristics, the situational variables investigated in public education must be generalized to the E-3A training program. Situational variables reviewed in this chapter (with corresponding E-3A variables identified in parentheses) include: Course of Study, which is composed of the sub-variables "subject matter" and "class size" (Crew Position and Functional Group), and "class section" (Aircrew Number); Instructor Academic Rank (Primary Instructor Status); and Study Time (Difference, representing excess days in training).

Course of Study

Research concerning "subject matter" as a variable relating to course ratings indicates that in many cases a relationship exists. Manley (1977) found that persons with positive attitudes toward a particular course of study viewed the class as being less difficult. Centra and Linn (1976) also found that there was a significant difference between major and nonmajor students when rating a particular college course of instruction. Walker (1969), who studied the relationship

between course subjects and teacher ratings at the junior college level, found that instructors of certain subjects received higher ratings than instructors of other subject areas. And Sheehan (1975), based on his review of research, reported that the subject matter variable tended to produce variations in student ratings.

"Class size" is a function of the course of study in the E-3A training program, and research indicates class size may be a factor relating to student ratings. Costin, Greenough and Menges (1971) reported there was conflicting evidence in the research concerning this variable and ratings of instruction. Two subsequent studies supported their findings. Aleamoni and Graham (1974), for example, reported class size did not account for differences in ratings assigned by students on an evaluation questionnaire at a major university, while the Haslett (1976) study demonstrated that the larger the class, the higher the students rated instruction.

The results of several studies conflicted with the Aleamoni and Graham (1974) and Haslett (1976) reports. McDaniel and Feldhusen (1970), using an 18 item instructor rating instrument at a major university, found class size significantly influenced ratings of course and instructor performance: the larger the class, the lower the instructor rating. Gage (1961), based on a study at a northern university, reported that instructors of larger classes consistently received lower ratings than those of smaller classes.

Closely related to subject matter and class size is "class section." Teacher control techniques unique to the training section are often found influencing student ratings. Where subject matter remains the same throughout several course sections, individual instructor

lesson plans may specify the nature of student participation in the classroom. Instructional strategies and teacher control therefore differ between sections.

Manley (1971), in a study of the relationship between the learning environment and student attitudes toward instruction, found that students had the most positive attitudes toward the course of instruction having a significantly more goal-directed structure. The impact instructors have on the structure of the class and subsequent ratings was highlighted by a study of an eastern public university in which 359 undergraduate students participated. The study, involving nine instructors and nine courses in differing disciplines, examined the relationship between student and instructor educational orientations and course ratings. The investigator reported that

> . . . when instructors had a stronger preference for either a more structured and formal education process (assigned learning) or for more unstructured and individually tailored learning experiences (independent study) they tended to receive lower course ratings (Morstain, 1977, p. 395).

The investigator also noted that instructors who were moderate both ways or not strong either tended to receive higher ratings.

Variables unique to the training section can have an effect on the rating variance. Student section assignment may relate to course evaluations because of the attitudes fostered by the section's environment or other variables. Because of this variable and those of subject matter and class size, the course of study may often influence student ratings of instruction. The relationship, however, appears to be situationally determined.

Instructor Academic Rank

The value and influence of the instructor in the educational process has long been recognized. However, the nature of this influence relative to student attitudes about instruction has often been found to be the instructor's academic rank.

In an analysis of student evaluations of faculty and courses, Lumsden (1973, p. 54) found that the higher the instructor's rank the better the course ratings. From his data he concluded that "the student's opinion of the instructor is by far the most important factor influencing the overall opinion of the course." Earlier studies had produced similar findings. Gage (1961) and Rayder (1968) each found that higher instructor rank correlated with higher ratings. The latter study also reported that instructor qualities (sex, age, degree, rank, years of experience) accounted for 27 percent of the variability of instructor ratings (Rayder, 1968). Some studies, however, revealed no significant relationship between instructor rank and ratings (Aleamoni, 1974; Haslett, 1976).

Training programs such as the military have a variety of instructor rankings. The literature suggests that instructor rank may influence student ratings. Evaluators should therefore consider and measure this relationship in their analysis of student ratings.

Study Time

The amount of time a student spends studying may also correlate with his evaluation of instruction. Lumsden (1973) reported that the more time the student spent on the course the higher he rated the

instructor overall. The size of his sample (n = 4996) lends substantial credibility to his findings. Another study (Pohlman and Elmore, 1976, p. 17), also found that "as the number of hours spent studying increased, the ratings of instructor and course became more favorable."

In a learning situation in which the issue is not the amount of time spent studying instruction, but rather the amount of time spent awaiting to be instructed, student ratings might be expected to decline as the waiting time increases. Wasting time during the learning process would decrease learning effectiveness according to the "principle of contiguity" (Gagne and Briggs, 1974, p. 7). An instructional system evaluator knowledgeable of achievement motives (Arkes and Carske, 1977) and principles of adult learning (Knowles, 1975) would anticipate lower course ratings as "dead time" increased in the training program.

The length of the training program may therefore influence student ratings of instruction. When course length is computed in terms of the time a student spends studying, course and instructor ratings tend to increase. Conversely, a theoretical analysis reveals that increasing "dead time" in training may decrease student ratings.

Summary

Instructional systems are designed to provide for a continuous feedback of information on the effectiveness of the system's components. One procedure for measuring instruction effectiveness is the use of student feedback through the measurement of student attitudes on a wide range of course components. Evaluators, administrators and instructors have a need for this data. Their recommendations and decisions on the

performance and direction of instructional system improvement must be made with a thorough understanding of all the data received.

Student feedback has often been shown to relate to non-instructional variables such as student characteristics and situational variables. This relationship may be a function of the rating scale or the training situation. It is necessary for the evaluators and administrators to measure all variables operant in the training situation so that student ratings can be thoroughly understood and effectively utilized in the management of the instructional system. The summative evaluation process must be thorough and complete if it is to be successful. The literature indicates that the student characteristics and situational variables reviewed in this chapter may account for significant portions of student course evaluation rating variance.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

The purpose of this chapter is to describe the design and methodology used in the study to test the research hypotheses and answer the research questions. Included in this chapter are descriptions of the study population, sample, and instruments used in the investigation. These descriptions are followed by a summary of the procedures for collecting the data and an identification of data analysis methods.

Population Description

The population for this study included all students receiving E-3A aircrew training at the 552nd Airborne Warning and Control Wing (AWACW), Tinker Air Force Base, Oklahoma, during the period between March, 1977, and March, 1978. The population included six "student instructor" aircrews and 15 operational aircrews.

The typical composition of an E-3A aircrew in the study population is identified in Table I. Seventeen crewmen perform 12 functionally different crew duties. Nine crewmen are officers and eight are enlisted personnel. The aircrew training program consists of eight courses which develop student skills and knowledges pertinent to each of the 12 crew positions. The commonality of some of these skills and knowledges

TABLE I

E-3A CREW POSITIONS, NUMBERS OF CREWMEN, MILITARY RANK AND COURSE IDENTIFICATION

Crew Position	Number of Crewmen	Military Rank	Course Identification
Pilot	2	Officer	E3AOOCOOPX/FX
Flight Engineer	1	Enlisted	E3AOOCOOPX/FX
Navigator	1	Officer	E3AOOCOONX
Mission Crew Commander	1	Officer	E3AOOCOOBX
Senior Weapons Director	1	Officer	E3AOOCOODX
Weapons Director	3	Officer	E3AOOCOODX
Air Surveillance Officer	1	Officer	E3AOOCOOGX
Air Surveillance Technician	3	Enlisted	E3AOOCOOGX
Radio Operator	1	Enlisted	E3AOOCOOTX/RX
Communications Technician	1	Enlisted	E3AOOCOOTX/RX
Computer Display Maintenance Tech	1	Enlisted	E3AOOCOOMX
Airborne Radar Technician	1	Enlisted	E3AOOCOOQX
Totals	17	9 Officers, 8 Enlisteds	12

Source: TAC Regulation 55-3 (1978), AF Manual 50-5 (1976).

accounts for the duplication of training.

Sample Description

The research sample included students of six operational aircrews. The aircrews selected for this study were those graduating during the period of December, 1977, through March, 1978. Selection of aircrews for this study was based on the availability of graduating operational aircrews during the study's data collection period.

The six aircrews studied were composed of crewmen originally assigned to seven operational aircrews. Student attrition in the Mission and Technician functional groups within these crews and the lack of available replacements necessitated the consolidation of the seven crews into six crews. This action resulted in a respondent aircrew distribution reflected in Table II.

Demographic data for the research sample are given in Table III. The data suggest that the respondents were experienced in their duties, career airmen and, to an extent, college educated. Most had volunteered for E-3A duty.

The functional group and crew position distributions for the research sample are given in Table IV. The Mission functional group had the largest number of respondents (58), and the Technician group had the smallest number of respondents (17). The number of subjects involved in this study and their distribution among aircrews, functional groups and crew positions were considered sufficient for data analysis.

Instrumentation

Instruments used for this study included the "Course Improvement

TABLE II

NUMBER OF RESPONDENTS TO THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE BY OPERATIONAL AIRCREW

Aircrew[1]	Respondents
1 (3A1, 3Q1)	16
2 (3A2, 3Q2)	18
3 (3A3, 3R1)	17
4 (3A4, 3R2)	15
5 (3B1, 3S1)	16
6 (3B2, 4A1, 4Q1)	20

[1]Crew numbers in parentheses reflect Flight and Mission crew numbers as defined by 552nd AWACW Regulation 55-6, 1977.

TABLE III

DEMOGRAPHIC CHARACTERISTICS OF STUDY SAMPLE

Characteristics	Statistic
Number of Respondents	102
Minority Respondents	13
Volunteers	87
Average Age	29.6
Respondents with Some College (No Degree)	23
Respondents with College Degrees	56
Median Officer Paygrade	O-3
Median Enlisted Paygrade	E-6
Average Years Active Military Service	10.6
Average Years Related Duty Experience	7.4

TABLE IV

NUMBER OF RESPONDENTS TO THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE BY FUNCTIONAL GROUP AND CREW POSITION

Functional Group	Crew Position	Number of Respondents	
Flight Crew	Pilot	14	
	Flight Engineer	7	
	Navigator	6	
(Group Total)			27
Mission Crew	Mission Crew Commander	5	
	Senior Weapons Director	7	
	Weapons Director	15	
	Air Surveillance Officer	7	
	Air Surveillance Technician	20	
	Radio Operator	4	
(Group Total)			58
Technician Crew	Communication Technician	6	
	Computer Design Maintenance Technician	6	
	Airborne Radar Technician	5	
(Group Total)			17
(Sample Total)			102

Questionnaire" and the "Instructional Systems Analysis Student Questionnaire." The following is a description of these two instruments.

Course Improvement Questionnaire

The Course Improvement Questionnaire, or CIQ, was developed for this investigation to elicit information from students participating in the study. The instrument is included in this report as Appendix A. Related literature provided guidance for development of the CIQ, particularly Best (1970) and Mager (1968). Once designed, faculty members of the Graduate College of Oklahoma State University, Stillwater, Oklahoma, reviewed the instrument and minor changes were made. Also, the questionnaire was coordinated with the Chief of the Training and Analysis Division of the 552nd AWACW Training Development Deputate for administration with the deputate's "Instructional Systems Analysis Student Questionnaire." Minor revisions to the CIQ's format and administration instructions were made based on this coordination.

The information requested on the questionnaire identifies student characteristics and situational variables germane to this investigation. Not all characteristics or variables found significant in the literature were included on the CIQ. The literature, as cited in Chapter II, has secondary and higher education as referent situations. The E-3A training program, however, is of a military environment having career military personnel administering and receiving instruction. Accordingly, only those literature variables which generalized to the study's population were included on the CIQ. Due to these unique circumstances, the validity of the instrument depends on an assumption made for this

investigation: students responded honestly to questionnaires used in this investigation.

Except for the student's standardization/evaluation scores received at the conclusion of training, all student characteristics and situational variables investigated by this study are identified on the CIQ. Standardization/evaluation scores were not available at the time of the questionnaire's administration and were obtained when posted to the student's records several weeks after student testing. The student responded to CIQ items 1 through 11, and the investigator completed items 12 through 17. The following is a definition of each item, including identification of the independent variables noted in the literature review (variable abbreviations used in the research are given in parentheses for each variable studied).

Item 1. Student Identification. (For administration purposes only.)

Item 2. Age of Student (AGE). The respondent's age is reported in five year increments and corresponds with the age variable discussed in the literature review.

Item 3. Years of Active Military Service (ACTMIL). The student's number of years of active military service relates to literature references on previous student experience and study.

Item 4. Paygrade (PAYGRD). Respondent paygrade indicates military rank. Literature references pertaining to student social status generalize to this variable.

Item 5. Promotion Eligibility (PROMOT). The eligibility of the student for promotion relates to literature references pertaining to student achievement and motivation.

Item 6. Ethnic Group Membership (ETHGRP). Ethnic group membership corresponds with the literature variable of the same description.

Item 7. Crew Position (CRWPST). The student's crew position on the E-3A identifies his course of study and relates to the same literature variable.

Item 8. Volunteer Status (VOLTER). Literature findings pertaining to the elective status of a course generalize to the respondent's volunteer status for E-3A aircrew duty.

Item 9. Education Level (EDLEVL). The E-3A student's formal education level relates to reported literature findings on this same subject.

Item 10. Years Experience in Related Duties (PREEXP). The number of years of previous respondent experience in duties similar to the respondent's expected E-3A duties relates to literature evidence on previous student experience and knowledge.

Item 11. Satisfaction with Training (OVRSAT). The satisfaction with training variable provides the investigator with a means for testing the consistency of certain independent and dependent variables. Its literature reference is related to student achievement and motivation.

Item 12. Aircrew Number (CN). The aircrew number identifies the aircrew to which the respondent was assigned during training. This variable relates to the course of study variable discussed in the literature review.

Item 13. Functional Group (FNGP). Functional group identification was made using the student's response to item 7 and the definition of each functional group given in Chapter I. This variable relates to the course of study variable discussed in Chapter II.

Item 14. Primary Instructor Status (PIS). The predominant military rank (officer or enlisted) of the respondent's instructors is identified based on the course of instruction for the student's aircrew position. Literature findings on instructor academic rank generalize to this variable.

Item 15. Calendar Days (CD). The number of calendar days between the time the student started and finished training is reported in this item.

Item 16. Syllabus Days (SD). The number of training days required by the student's course of instruction is reported here and is based on the course's syllabus.

Item 17. Difference (DIF). The difference between items 15 and 16 is computed. The difference (a positive number because item 15 includes weekends and holidays whereas item 16 does not) relates to literature evidence and theory cited on the amount of time the student studies and training "dead time."

Other Variables. Open book (OPEN) and closed book (CLOSED) written test scores and performance evaluation ratings (CHCKRIDE) received by each student at the conclusion of training were noted on the CIQ by the instructor. These standardization/evaluation scores relate to literature findings pertaining to student achievement and expected or actual grades.

Student characteristics identified by the CIQ are Age of Student, Years Active Military Service, Paygrade, Promotion Eligibility, Ethnic Group Membership, Volunteer Status, Education Level, Years Experience in Related Duties, Satisfaction with Training, and Standardization/Evaluation Scores. Situation variables investigated in this study are Crew

Position, Functional Group, Aircrew Number, Primary Instructor Status, and Difference (excess time in training).

Instructional Systems Analysis

Student Questionnaire

The Instructional Systems Analysis Student Questionnaire is commonly referred to as the E-3A course evaluation questionnaire (CEQ). The CEQ, included as Appendix B, was developed by the 552nd AWACW to measure student attitudes pertaining to the E-3A training program. Its development was in response to an institutional requirement for evaluative information on the effectiveness of the E-3A instructional system.

The CEQ is a Likert type questionnaire having seven major subscales. The seven subscales (with abbreviations used in this study included in parentheses) are Tests (TESTS), Course Design (CRSDES), Instructor Performance (INSTPER), Training Materials (TNGMAT), Training Aids (TNGAID), Classroom Setting (CLSSRM), and Student Motivation (STUMOT). There are 100 stimulus items in the questionnaire. Development of the instrument was based on two studies conducted by the Air Force at Lowry Air Force Base, Colorado (Federico, 1970; Miller and Sellman, 1973).

The two source investigations were phase studies attempting to develop a more effective student end of course critique for the Air Force's Air Training Command. The Federico (1970) study involved the development of a 55 item questionnaire and a comparative study of various questionnaire techniques for eliciting student attitudes. The Likert technique was found the most effective. Miller and Sellman (1973) conducted the next phase of the research resulting in 14 new

items added to the original instrument.

Instructional systems evaluators of the 552nd AWACW developed the CEQ based on the final 69 items reported in the Miller and Sellman (1973) study and additional items written for the E-3A situation. To reduce student rating bias, E-3A evaluators rotated subscale items within the entire CEQ scale. Item subscale distributions are identified in Appendix C. Since the instrument is a Likert type questionnaire, each stimulus item requires the student to indicate a degree of concurrence with a given statement. The scale of concurrence corresponds with that identified by Anastasi (1971) and is consistent with the Federico (1970) and Miller and Sellman (1973) investigations. Of the 100 CEQ items, 26 are statements having negative direction. These statements, however, are weighted in the opposite direction to give the entire scale a single rating direction. Values assigned by the 552nd AWACW to each rating are given in Table V.

TABLE V

ASSIGNED VALUES FOR STUDENT RESPONSES TO THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE

Response Category	Positive Statement Numerical Value	Negative Statement Numerical Value
Strongly Agree	5	1
Agree	4	2
Undecided	3	3
Disagree	2	4
Strongly Disagree	1	5

The reliability of the CEQ had not been estimated prior to this study. Federico (1970), however, reported a test-retest reliability of .73 for his 55 item questionnaire. Miller and Sellman (1973) reported raising the instrument's test-retest reliability to .80 after adding 14 new items. For this study, the investigator obtained a measure of internal consistency for the CEQ and each of its subscales using a technique developed by Cronbach (1951). The Cronbach technique is an internal consistency measure estimating reliabilities based on the relationship between the number of items on the instrument and the variances for the instrument and each of its subscales.

Two types of validity are reported for the CEQ, sampling validity and face validity. The instrument's sampling validity is based on the Federico (1970) and Miller and Sellman (1973) studies. Stimulus items used in these investigations were developed from student attitudes toward training mentioned five or more times by students in research cited by Federico (1970). Ninety-one of the items generated for the CEQ originated from the 69 items reported in the Miller and Sellman (1973) study. The degree of correspondence between CEQ items and those of the cited study suggest sampling validity, assuming the items used by Miller and Sellman (1973) generalize to the E-3A training situation (see Table VI).

The face validity of the CEQ is related to the nature of its development. Though 54 of the instrument's items are identical to those used in the Miller and Sellman (1973) study, 37 others were alterations of original Miller and Sellman items. Also, nine other CEQ items were newly generated without reference to the cited study. This amount of item independence between the CEQ and its source questionnaire suggests

TABLE VI

DEGREE OF CORRESPONDENCE BETWEEN THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE SUBSCALE ITEMS AND ITEMS OF A RELATED AIR FORCE STUDY[1]

Subscale	Number of Subscale Items	Number of Items and Degree of Correspondence to Another Study			Number of New Items
		Same	Similar	Stimulus	
Tests	13	5	3	5	0
Course Design	24	12	0	9	3
Instructor Performance	22	11	2	8	1
Training Materials	10	10	0	0	0
Training Aids	13	9	1	3	0
Classroom Setting	12	7	0	4	1
Student Motivation	6	0	0	2	4
(Totals)	100	54	6	31	9

[1]Referenced study is Miller and Sellman (1973).

a degree of face validity since E-3A training personnel produced item alterations and designed new items to meet the unique needs of the E-3A training program.

The instruments used in this study include a personal data questionnaire (Course Improvement Questionnaire) and a course evaluation questionnaire (Instructional Systems Analysis Student Questionnaire). The CIQ identifies student characteristics and situational variables used in the investigation to account for rating variance of the CEQ. It is assumed that respondents answered the questionnaire to the best of their ability. The sampling and face validity of the CEQ appear adequate for the situation in which the instrument is used.

Procedures for Data Collection

The CEQ is administered to aircrew members by the 552nd AWACW Training Development Deputate. Scheduling the questionnaire's administration is a function of the deputate and is initiated when the E-3A weekly training schedule shows an aircrew is completing the training program. Questionnaire administration often occurs before graduation due to unanticipated and last minute training delays. Individual students not available when other aircrew members are administered the questionnaire are asked to complete the instrument on an individual basis.

The scheduling procedures used by the 552nd AWACW are designed to accommodate the needs and training requirements of the E-3A weapon system. The timing of questionnaire administration is flexible. As noted in Chapter II, many investigators have suggested that the timing of course evaluation is not critical to the ratings since such

evaluations tend to be stable over time (Costin, Greenough and Menges, 1971; Frey, 1976; Kohlan, 1973; Kulik, 1975; McCollister et al., 1975). The scheduling procedures for CEQ administration were therefore assumed not to significantly effect student course evaluation responses.

The CIQ was administered in conjunction with the CEQ and was attached to the CEQ's answer sheet. Guidance given students for completing the two questionnaires is summarized below:

1. Instructions printed on the CIQ for completing the instrument were read aloud to the students.
2. The students were advised to review the privacy act statement printed on the reverse side of the CIQ before completing either questionnaire.
3. The students were told to read each item on the CEQ and select the response choice most accurately describing their degree of concurrence with the item statement. The student was told not to respond to items not relevant to his expectancies.
4. CEQ answers were to be recorded on the answer sheet attached to the CIQ by marking the corresponding response choice letter (a, b, c, d, or e) for each CEQ item.
5. Written comments, though not required, could be given on the reverse side of the answer sheet.

Additional data required for the study was obtained by the investigator from student training records and materials. A training schedule record book maintained by the 966 Airborne Warning and Control Training Squadron contained the start and completion dates for each student receiving the E-3A aircrew training. This information was used to compute the number of calendar days each student was in training. The

number of syllabus training days was obtained from course syllabi.

Other data required on the CIQ but not furnished by the student were obtained by evaluating student responses to certain CIQ items and reviewing published aircrew training schedules and syllabi. Student scores on the standardization/evaluation examinations given at the completion of training by the 552nd AWACW Standardization/Evaluation Section of the Operations Deputate were obtained from the student's Air Force Form 8, "Certification of Aircrew Qualification."

These examinations determine the student's qualification for aircrew duty. The closed book written examination is a written test composed of selection type questions measuring the student's knowledge of emergency procedures. The open book examination is also a written test composed of selection type questions but measures the student's knowledge of aircraft operations procedures. Scores for both tests are reported as percentage of total items answered correctly.

The performance evaluation (checkride) is administered after the closed and open book examinations. This evaluation measures the student's skills at performing the inflight tasks of his crew position. Ratings assigned are Q1 (qualified), Q2 (qualified but requiring more training), and Q3 (not qualified). Sample data for the standardization/evaluation examinations are reported in Appendix D.

The data obtained from the CIQ and student records identified student characteristics and situational variables used to analyze student rating variance on the CEQ. The data were gathered by training personnel of the 552nd AWACW Training Development Deputate in conjunction with their normal duties and submitted to the investigator for analysis. The

investigator conducted the records review to obtain additional information not furnished by the students or training personnel.

Methods for Data Analysis

Many of the studies analyzing the relationship between non-instructional variables (student characteristics and situational variables) and course evaluation ratings have used analysis of variance (Forward et al., 1975; Lumsden, 1973; Pohlman and Elmore, 1976; Haslett, 1976; Treffinger and Feldhusen, 1970). Kerlinger and Pedhazur (1973, p. 2) defined analysis of variance as "the partitioning, isolation, and identification of variation in a dependent variable due to different independent variables."

Multiple regression analysis was used in this investigation to test the study's research hypotheses and answer the research questions. Multiple regression facilitates determination of "the collective and separate contribution of two or more independent variables, X_i, to the variation of a dependent variable, Y" (Kerlinger and Pedhazur, 1973, p. 3). This statistical procedure allowed the investigator to measure the relationship between the independent variables (student characteristics and situational variables) and the dependent variables (student ratings of the course of instruction). Also, a one-way analysis of variance was used to test for rating differences between the functional groups of the FNGP non-instructional variable.

Multiple regression is a procedure which may be used to demonstrate magnitudes of relationship between two or more variables. Non-instructional variables measured by nominal or ordinal scales were entered into the regression by the use of dummy variables (Kerlinger and Pedhazur,

1973). When using dummy variables to quantify a nominal or ordinal variable, statistically significant relationships are indicated by a significant multiple correlation between the appropriate set of dummy variables and the dependent variable of interest. To determine the direction of the relationship, Pearson correlations were computed for non-instructional variables which demonstrated significant relationships to CEQ or subscale rating variance.

The .05 level of significance was selected as the criterion for rejecting the null hypothesis and for answering in the affirmative the research questions. Though not a criterion, the .01 level of significance was reported for those relationships demonstrating $p \leq .01$.

Summary

The purpose of this study was to determine the relationship between certain non-instructional variables (student characteristics and situational variables) and student ratings on the CEQ. To conduct this investigation, the investigator developed the CIQ which identified the independent variables used in this study. The CEQ, developed by the 552nd AWACW, provided the data for the dependent variables.

The instruments used in this study were administered together. Their administration was under the direction of the 552nd AWACW Training Development Deputate and accomplished in accordance with the deputate's training evaluation process. Records reviewed by the investigator provided the remaining data required for the investigation. Data analysis methods selected for the study were consistent with those used in other studies of this type, primarily involving regression analysis procedures. The criterion for rejecting the null hypothesis was set at $p \leq .05$.

CHAPTER IV

RESULTS

Introduction

The analysis of student responses to the CEQ is presented in this chapter. The purpose of this study was to determine the relationship between non-instructional variables (student characteristics and situational variables) and student ratings of aircrew training. The CIQ identified the independent variables, and ratings of instruction were recorded on the CEQ.

The specific research questions examined by this study were stated in Chapter I. The null hypothesis, that there is no relationship between student ratings and certain non-instructional variables, was tested using multiple regression procedures.

The research was conducted using six operational aircrews completing aircrew training for the E-3A Airborne Warning and Control System aircraft at Tinker Air Force Base, Oklahoma, during the period December, 1977, through March, 1978. The sample included 102 student aircrew members. Administration of the CIQ instrument was in conjunction with established procedures for the 522nd AWACW course evaluation program and accomplished concurrently with the administration of the Wing's CEQ instrument. Both instruments were administered by Air Force representatives. Response information obtained from the CIQ is included in Appendix D.

The analysis of data reported in this chapter includes the reporting of CEQ reliability and subscale intercorrelations computed from the present sample's responses to the instrument. Correlation and squares of correlation coefficients computed from this data obtained through multiple regression procedures are also reported for the relationships between selected student characteristics and CEQ ratings and between selected situational variables and CEQ ratings.

Analysis of Data

Reliability Estimates

Student responses to items of the CEQ, mean item ratings and standard deviations are reported in Appendix E. Means and standard deviations for the CEQ and its subscales are reported in Appendix F.

Cronbach alpha (Cronbach, 1951) was used to obtain internal consistency reliability estimates for the CEQ and its subscales. The coefficient alphas, reported in Table VII, indicate that the CEQ instrument and its subscales have a high degree of internal consistency. Subscale coefficient alphas ranged from .681 (Classroom Setting) to .966 (Training Aids). The overall instrument (CEQ) produced a coefficient alpha of .951, exceeding the .80 test-retest reliability coefficient reported by Miller and Sellman (1973) for the CEQ's parent questionnaire.

Subscale Intercorrelations

The correlations between CEQ subscales are reported in Table VIII. Two sets of Pearson r's are evidenced. First, the intercorrelations of TESTS, CRSDES, INSTPER, and TNGMAT. All of the intercorrelations for

this set exceeded .50. The second set of Pearson r's is the intercorrelations of TNGAID, CLSSRM, and STUMOT. Intercorrelations for this set were all less than .50. The first set of subscales measures student attitudes concerning aspects of the instructional system with which the students interact, and the second set of subscales measures more divergent aspects of the training program in which student contact is more passive. This subscale difference may account for the lower r's in the second set.

TABLE VII

COEFFICIENT ALPHA ESTIMATES FOR THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SEVEN SUBSCALES

Scale	α
CEQ	.951
Subscale:	
Tests	.781
Crsdes	.883
Instper	.901
Tngmat	.802
Tngaid	.996
Clssrm	.681
Stumot	.791

TABLE VIII

PEARSON CORRELATIONS BETWEEN INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) SUBSCALES

Scale	Subscale						
	Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
CEQ	.733	.835	.835	.673	.638	.483	.448
Subscale:							
Tests	-	.547	.576	.632	.248	.214	.422
Crsdes		-	.617	.525	.444	.383	.293
Instper			-	.551	.372	.276	.409
Tngmat				-	.099	.269	.411
Tngaid					-	.358	.013
Clssrm						-	.001
Stumot							-

Note: $r \geq .205$, $p \leq .05$; $r \geq .267$, $p \leq .01$.

It should also be noted that all subscale intercorrelations, with the exceptions of TNGAID with TNGMAT, and STUMOT with TNGAID and CLSSRM were significant at the .05 level. In no case did the proportion of shared variance for any two subscales exceed 40 percent ($r^2 \times 100$).

Miller and Sellman (1973) reported subscale intercorrelations for their instrument consistent with those found in the CEQ. Pearson r's reported by these investigators ranged from .28 to .59. Subscale construction and definition in the Miller and Sellman (1973) study differed from that of the CEQ. Subscales developed for the CEQ were not designed

to measure the same aspects of the instructional system as those subscales developed by Miller and Sellman (1973). Also, item-subscale assignments differ, and the CEQ contains a subscale not found in the Miller and Sellman questionnaires (Student Motivation). Further comparison between instruments was therefore considered inappropriate.

The internal consistency of the CEQ subscales and the correlations between the instrument's subscales suggest the instrument is well designed. The coefficient alphas and Pearson r's reported in this study also suggest that the multiple regression analysis used to test the research hypothesis used data obtained from a reliable instrument.

Non-Instructional Variables and CEQ Ratings

This study examined the relationship between 15 non-instructional variables (student characteristics and situational variables) and student ratings on the CEQ. The results of the computation of correlation and squares of correlation coefficients from the multiple regression analysis are presented in Table IX. The results indicated many variables accounted for significant proportions of student rating variance on the CEQ and its subscales. Four variables (OPEN, CLOSE, ACTMIL and VOLTER) reflected no significance for either the CEQ or any of its subscales.

The achievement related variables (OPEN, CLOSE, CHCKRIDE and PROMOT) were found to relate to only three of the 32 possible CEQ and subscale correlations. PROMOT accounted for only one of the significant correlations (with TNGAID), and CHCKRIDE accounted for the other two relationships (with TNGAID and CLSSRM).

TABLE IX

CORRELATIONS AND SQUARES OF CORRELATION COEFFICIENTS FOR NON-INSTRUCTIONAL VARIABLES ACCOUNTING FOR RATING VARIANCE OF THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SUBSCALES

		Subscale						
Variable	CEQ	Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
DIF*	.246**	.287	.234	.257	.139	.009	.160	.174
	(.060)	(.082)	(.055)	(.066)	(.019)	(.000)	(.028)	(.030)
Open	.035	.175	.016	.013	.109	.009	.032	.032
	(.001)	(.031)	(.000)	(.000)	(.012)	(.000)	(.001)	(.001)
Close	.072	.045	.127	.065	.060	.094	.033	.102
	(.005)	(.002)	(.016)	(.004)	(.004)	(.009)	(.001)	(.010)
Actmil	.143	.083	.135	.097	.131	.132	.125	.125
	(.020)	(.009)	(.018)	(.009)	(.017)	(.018)	(.016)	(.016)
Chckride	.155	.163	.086	.076	.034	.220	.229	.012
	(.024)	(.027)	(.007)	(.006)	(.001)	(.048)	(.053)	(.000)
Age	.138	.222	.228	.181	.100	.101	.292	.228
	(.019)	(.049)	(.052)	(.032)	(.010)	(.010)	(.085)	(.052)
Paygrd	.436	.479	.316	.235	.102	.418	.080	.573
	(.190)	(.229)	(.100)	(.055)	(.010)	(.175)	(.006)	(.329)
Promot	.142	.057	.134	.170	.031	.399	.125	.042
	(.020)	(.003)	(.018)	(.029)	(.001)	(.159)	(.016)	(.002)

TABLE IX (Continued)

Variable	CEQ	Subscale						
		Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
Ethgrp	.148 (.022)	.148 (.022)	.173 (.030)	.189 (.034)	.111 (.012)	.295 (.087)	.135 (.018)	.122 (.015)
Crwpst*	.307 (.094)	.279 (.078)	.365 (.133)	.196 (.038)	.230 (.053)	.351 (.123)	.385 (.148)	.135 (.024)
Edlevl	.076 (.006)	.107 (.011)	.094 (.009)	.266 (.071)	.090 (.008)	.089 (.001)	.145 (.021)	.114 (.013)
Preexp	.413 (.170)	.210 (.044)	.474 (.225)	.360 (.129)	.238 (.057)	.233 (.054)	.535 (.286)	.086 (.007)
Ovrsat	.192 (.037)	.181 (.033)	.116 (.014)	.140 (.020)	.105 (.011)	.212 (.045)	.074 (.005)	.250 (.062)
CN*	.374 (.140)	.359 (.129)	.362 (.131)	.184 (.034)	.199 (.040)	.357 (.127)	.326 (.106)	.175 (.031)
Volter	.056 (.003)	.006 (.000)	.061 (.004)	.043 (.002)	.067 (.004)	.123 (.015)	.166 (.028)	.162 (.026)
PIS*	.125 (.016)	.014 (.000)	.111 (.012)	.011 (.000)	.003 (.000)	.224 (.050)	.241 (.058)	.024 (.001)

*Denotes situational variable; all other non-instructional variables are student characteristics.

**Top number is r, bottom number in parentheses is r^2. $r \geq .205$, $p \leq .05$; $r \geq .276$, $p \leq .01$.

Three non-instructional variables accounted for significant proportions of the rating variance on only one subscale each (PROMOT was found related with TNGAID, ETHGRP with TNGAID, and EDLEVL was related with INSTPER). Also, three other non-instructional variables accounted for significant proportions of rating variance on only two subscales each (CHCKRIDE with TNGAID and STUMOT, and PIS with TNGAID and CLSSRM). None of these six variables accounted for significant proportions of the CEQ rating variance.

Of all the non-instructional variables relating to three or more subscales (DIF, AGE, PAYGRD, CRWPST, PREEXP, and CN), only AGE did not account for significant proportions of the CEQ rating variance ($r = .138$). Of these variables, the correlation of DIF with CEQ was significant at .05 while the correlations of all other variables with CEQ were significant with CEQ at .01. The non-instructional variables accounting for rating variance on the most number of subscales were PREEXP (six subscales), CRWPST (five subscales), PAYGRD (five subscales), AGE (four subscales) and CN (four subscales).

The FNGP variable was not included in the regression equation because it is totally determined by CRWPST factors. A one-way analysis of variance, however, was conducted to test for differences between the three FNGP groups (Flight Crew, Mission Crew and Technician Crew) on CEQ ratings. Results of the analysis reported in Table X revealed that the functional groups did not differ significantly in their ratings on the CEQ or any of its subscales.

The multiple regression equation yielded beta weights for the PREEXP, CRWPST, and CN variables in excess of 1.0. The occurrence of these excessive beta weights, however, was infrequent. Where excessive

TABLE X

RESULTS OF ANALYSIS OF VARIANCE OF THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SUBSCALE SCORES WITH FUNCTIONAL GROUP

Scale	MS_B	MS_W	F	p
CEQ	.212	.144	1.473	.234
Subscale:				
Tests	.603	.246	2.453	.091
Crsdes	.346	.170	2.036	.136
Instper	.368	.259	1.423	.246
Tngmat	.569	.363	1.566	.214
Tngaid	.241	.848	0.285	.753
Clssrm	.322	.119	2.700	.072
Stumot	.483	.474	1.020	.364

Note: All df = 2,99.

beta weights occurred, the resultant correlation coefficients were significant. Kerlinger and Pedhazur (1973) recognized this phenomenon and explained it in the following manner:

> In nonexperimental, or ex post facto, research, the independent variables are generally correlated, sometimes substantially. This makes it difficult, if not impossible, to untangle the variance accounted for in the dependent variable and to attribute portions of it to individual independent variables. Various authors have addressed themselves to this problem some concluding that it is insoluable (p. 296).

The excessive beta weights found in this research could not be explained by this investigator. The resultant r's and r^2's were therefore accepted prima facie. It should be noted, however, that estimates of CEQ and subscale variance accounted for by these variables are inflated by an unknown amount.

Rankings of the significant variables by CEQ and subscale revealed no apparent variable pattern. Table XI does reveal, however, that two student characteristics (PAYGRD or PREEXP) accounted for the highest ranking for each subscale. Neither variable, however, consistently ranked high when not ranked first. The situational variables DIF, CN and PIS were generally ranked in the middle rankings for most of the subscales. Other relationships between variable rank and subscale were not apparent.

Dummy variables were used in the regression procedure to determine the magnitude of relationship. Where significant relationships were found, the direction of each relationship was determined by examining the Pearson correlations between the significant non-instructional variable and subscale variances. The Pearson r's for the significant non-instructional variables are reported in Table XII.

TABLE XI

RANKINGS BY SUBSCALE OF SIGNIFICANT NON-INSTRUCTIONAL VARIABLES RELATING TO RATING VARIANCE ON THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ)

Variable Rank	CEQ	Subscale						
		Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
1	Paygrd	Paygrd	Preexp	Preexp	Preexp	Paygrd	Preexp	Paygrd
2	Preexp	CN*	Crwpst*	Edlevl	Crwpst*	Promot	Crwpst*	Ovrsat
3	CN*	DIF*	CN*	DIF*	-	CN*	CN*	Age
4	Crwpst*	Crwpst*	Paygrd	Paygrd		Crwpst*	Age	-
5	DIF*	Age	DIF*	-		Ethgrp	PIS*	
6	-	Preexp	Age			Preexp	Chckride	
7		-	-			PIS*	-	
8						Chckride		
9						Ovrsat		
						-		

*Denotes situational variable; all other non-instructional variables are student characteristics.

TABLE XII

PEARSON CORRELATIONS FOR NON-INSTRUCTIONAL VARIABLES DEMONSTRATING SIGNIFICANT MULTIPLE CORRELATIONS WITH RATINGS OF THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SUBSCALES

		Subscale						
Variable	CEQ	Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
DIF	-.397**	-.368**	-.345**	-.441**				
Chckride						-.125	.082	
Age		.091	.181*				-.023	.114
Paygrd	.064	.123	.027	.021		-.087		.105
Promot						-.009		
Ethgrp						.226*		
Crwpst	-.147	-.228*	-.080		-.294*	.029	-.120	
Edlevl				-.014				
Preexp	.200*	.152	.207*	.234*	.093	.074	.152	
Ovrsat						-.226*		-.242**

TABLE XII (Continued)

Variable	CEQ	Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
CN	.207*	.037	.129			.330**	.098	
PIS						-.024	.085	

*Denotes $p \leq .05$.

**Denotes $p \leq .01$.

As shown in Table XII, several non-instructional variables have a significant relationship with CEQ subscale rating variance. In each instance where DIF accounted for a significant proportion of rating variance, a significant but low negative relationship existed between the DIF variable and the CEQ or subscale variance. This relationship reveals that as length of excess training time increases in the training program, ratings of instruction tend to decrease for those subscales of the CEQ where this relationship is significant.

Also demonstrating a significant but low negative relationship with subscale rating variance was the non-instructional variable OVRSAT. The negative relationship between OVRSAT and subscales TNGAID and STUMOT indicate that as the degree of student dissatisfaction with training increases, favorable ratings for these subscales decrease.

Significant low positive relationships between non-instructional variables and CEQ or subscale rating variances were found for AGE, PREEXP and CN. As student age increases, so did favorable ratings on stimulus items of the CRSDES subscale ($r = .181$). Also, there is a low relationship between a student's number of years of previous related crew experience with the favorable ratings on stimulus items for subscales CRSDES and INSTPER as well as for the entire CEQ instrument.

A significant low positive correlation was also found between the non-instructional variable CN and rating variance for the CEQ and subscale TNGAID. The more recent the aircrew began training, the more favorably its crewmembers rated instruction.

As shown in Table XII, the ETHGRP and CRWPST variables demonstrated significant correlations with CEQ and several subscales. These two

variables, however, do not contain ordinal values. Interpreting a direction of relationship is therefore inappropriate.

Those non-instructional variables which accounted for a significant proportion of variance in CEQ and subscale ratings were grouped as student characteristics or situational variables. Also selected as a single criterion was a grouping of all the significant non-instructional variables. Correlation coefficients and their squares for each of these three composite groups were computed from multiple regression analysis data. The results are reported in Table XIII.

Table XIII shows that student characteristics accounted for a significant proportion of the rating variance for the CEQ and each of the subscales. The .01 level of significance was achieved on the CEQ and each of the subscales except for INSTPER, which yielded a .05 level of significance. As a single criterion, student characteristics accounted for 36.1 percent of the CEQ rating variance and, for the subscales, accounted for rating variances ranging from 5.7 percent (INSTPER) to 56.8 percent (TNGAID).

Situational variables also accounted for a significant proportion of the CEQ rating variance and the rating variances of six of the seven subscales. The amount of variance attributed to situational variables as a single criterion was significant at the .05 level for subscales INSTPER and TNGMAT and significant at the .01 level for TESTS, CRSDES, TNGAID and CLSSRM. No situational variable was found to account for the rating variance on the STUMOT subscale. For the CEQ, 29.5 percent of the rating variance was attributed to significant situational variables, while subscale proportions ranged from 5.3 percent (TNGMAT) to 31.8 percent (CRSDES).

TABLE XIII

CORRELATION AND SQUARES OF CORRELATION COEFFICIENTS FOR STUDENT CHARACTERISTICS, SITUATIONAL VARIABLES, AND NON-INSTRUCTIONAL VARIABLES ACCOUNTING FOR RATING VARIANCE OF THE INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SUBSCALES

Criterion		CEQ	Subscale						
			Tests	Crsdes	Instper	Tngmat	Tngaid	Clssrm	Stumot
Student Characteristics	r	.600	.568	.614	.505	.238	.754	.651	.666
	r^2	.361	.323	.376	.255	.057	.568	.424	.443
Situational Variables	r	.543	.538	.564	.257	.230	.549	.559	.000
	r^2	.295	.289	.318	.066	.053	.300	.313	.000
All Non-Instructional Variables	r	.810	.782	.834	.566	.331	.932	.858	.666
	r^2	.425	.500	.510	.416	.175	.727	.290	.292

Note: $r \geq .205$, $p \leq .05$; $r \geq .267$, $p \leq .01$.

The composite of all the significant non-instructional variables was also found to account for significant proportions of CEQ and subscale rating variances at the .01 level of significance. The multiple correlation coefficient (r^2) indicated that .425 of the CEQ rating variance was a result of all significant non-instructional variable influence. And, subscale rating variance accountability for the composite of all significant non-instructional variables ranged from 17.5 percent (TNGMAT) to 51.0 percent (CRSDES).

Summary

The analysis of data revealed that the CEQ, as administered to the research sample, had high internal consistency reliability. Coefficient alpha for the CEQ was .951, and the subscale alphas ranged from .681 (CLSSRM) to .966 (TNGAID). Subscale intercorrelations with the CEQ were all significant, and intercorrelations among the subscales were significant in all but three cases.

Four non-instructional variables were found not to correlate with CEQ rating variance or that of any of the subscales. Also, six variables accounted for significant proportions of the rating variance on one or two subscales, but not on the CEQ.

PAYGRD and PREEXP accounted for the largest proportion of the CEQ rating variance, together accounting for 36.0 percent. AGE, while relating to rating variance on four of the seven subscales, did not appear to account for CEQ rating variance.

Pearson correlations computed to determine the direction of the significant relationships between non-instructional variables and CEQ and subscale rating variances demonstrated the existence of significant

relationships. Low negative relationships were reported for non-instructional variables DIF and OVRSAT. Also, low positive relationships were found for non-instructional variables AGE, PREEXP and CN. The remaining relationships were weak and nonsignificant, or the values for the non-instructional variables did not include ordinal data.

Significant non-instructional variable composites were also found to account for CEQ and subscale rating variances. The student characteristics criterion produced significant variance accountability for the CEQ and all subscales, whereas situational variables, also accounting for a significant proportion of the CEQ variance, accounted for rating variances on only six of the seven subscales. The multiple correlation coefficient for the composite of all significant non-instructional variables was significant at the .01 level.

The data analyzed in the study produced numerous significant relationships which offer a variety of meaningful data for E-3A training manager use. Chapter V addresses the use of these data.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this study was to identify the relationship between certain non-instructional variables (student characteristics and situational variables) and ratings of E-3A instruction given by students of the 522nd AWACW. Six operational aircrews were selected from the aircrew training population for the period between March, 1977, and March, 1978. The selection of the sample was limited to the availability of graduating operational aircrews during the period of data collection.

Also limiting the study was the Air Force's procedural requirements for course evaluation. Administration of instruments was managed by the 552nd AWACW. The scheduling of instrument administration and the rendering of instructions to the respondents were not under the direct control of the investigator.

The analysis of data revealed that the CEQ produced high internal consistency reliability and subscale intercorrelation coefficients. While many of the non-instructional variables were found to account for significant proportions of the CEQ and subscale rating variances, the grouping of significant student characteristics and situational variables and the composite of all significant non-instructional variables also accounted for significant proportions of CEQ and subscale rating

variances.

The results of this study provide a wide range of data from which several conclusions and recommendations can be made. This chapter summarizes the important conclusions resulting from this study and includes recommendations for subsequent research.

Conclusions

There were three research questions related to this investigation. Do certain student characteristics account for a significant proportion of the rating variance on the CEQ or its subscales? Do certain situational variables account for a significant proportion of the rating variance on the CEQ or its subscales? And, do certain student characteristics and situational variables jointly account for a significant proportion of the rating variance of the CEQ or its subscales?

The results reported in Table XIII show that these questions should be answered in the affirmative. Student characteristics did account for CEQ and subscale rating variance, as did the situational variables. The composite of all the significant non-instructional variables also accounted for 42.5 percent of the CEQ rating variance.

The research problem was stated as a null hypothesis: there is no relationship between student ratings on the CEQ or its subscales and student characteristics or situational variables. This hypothesis was rejected on the basis of the data reported in Table IX and Table XIII. The alternative hypothesis, that there is a relationship, was therefore accepted.

Based on the results of this study, 42.5 percent of the CEQ rating variance can be attributed to non-instructional variables. This

statistic is high compared to other investigations in which rating variance attributed to non-instructional variables was no higher than 27.0 percent (Rayder, 1968; Haslett, 1976; Pohlman and Elmore, 1970). The magnitude of the relationships between non-instructional variables and the CEQ and its subscales indicated by this study (Tables IX and XIII) suggest additional research will enable training managers to predict ratings from a demographic analysis of the students. Prediction of CEQ ratings is the first step in using knowledge of non-instructional variables to allow training managers to more effectively interpret these ratings.

Many of the correlations between non-instructional variables and CEQ and subscale rating variances were unexpectedly insignificant. ACTMIL demonstrated no significant relationships. Contrary to these findings, Lumsden (1973), Hall (1977) and Haslett (1976) reported finding a relationship between previous experience (or knowledgeability) and course evaluations. The VOLTER variable also produced no significant relationship with any subscale or the CEQ. The small number of non-volunteers (n = 15) and the resulting limited VOLTER variance is thought to have reduced the amount of rating variance accounted for by the VOLTER variable. Future investigators studying this variable should attempt to obtain samples for which the number of volunteers and non-volunteers is more nearly equal.

The unique aspects of this research sample reflect a narrow range of values for military service factors (career military, high volunteer percentage, high qualifications for assignment selection). The restriction in range on these factors may have reduced the correlation of these factors with the CEQ ratings. Thus, the percent of CEQ variance

accounted for by these factors, as reflected in the ACTMIL and VOLTER variables, may be an underestimate of the true relationship.

The achievement related variables (OPEN, CLOSE, CHCKRIDE and PROMOT) did not provide many significant correlations. Only three of the 32 correlations were found significant. Though many investigators have found achievement measures to relate to ratings of instruction (Centra and Linn, 1976; Curry, 1976; and Weaver, 1960), the literature reviewed by Costin, Greenough and Menges (1971) revealed that where results were significant they were typically weak. The results of this investigation are consistent with the conclusions of the Costin, Greenough and Menges (1971) study.

The non-instructional variable ETHGRP accounted for a significant proportion of the rating variance for the TNGAID subscale ($r = .295$, $p < .01$). Since ETHGRP did not significantly account for rating variance on any other subscale or the CEQ, the possibility of random significance exists. However, limited ETHGRP variance caused by the small number of minority members responding to the CIQ and CEQ ($n = 13$) may have contributed to the lack of significant relationships. The existence of a significant relationship between ETHGRP and TNGAID despite the lack of ETHGRP variable variance suggests there may be racial differences in student ratings of E-3A instruction. A future study should attempt to measure this variable using a sample having adequate variable variance for meaningful data analysis.

The non-instructional variable EDLEVL was also found to significantly account for the rating variance of only one subscale, INSTPER ($r = .266$, $p < .05$). The literature suggests this is a valid relationship. Aleamoni and Graham (1974) and Centra and Linn (1976) found

highly significant differences between education levels and ratings of instruction. Frey, Leonard and Beatty (1975, p. 443) reported "there is a reliable trend for the more senior students to give higher ratings to their instructors" when comparing rating differences among college students. The Pearson correlations obtained for this study, however, showed no significant direction for the EDLEVL variable with INSTPER ($r = -.014$). The lack of additional evidence suggests the relationship between EDLEVL and INSTPER for this research sample was a result of random significance.

The variable CN significantly accounted for the rating variance of several subscales and ranked third among all non-instructional variables for CEQ rating variances accounted for ($r^2 = .140$). The Pearson correlations reported in Table XII also demonstrated a trend for the more recent aircrews to rate instruction more favorably.

The E-3A training program began training operational aircrews in March, 1977, and many of the students then entering the new training program were represented in the research sample. It appears that as the training program matures, students of later aircrews perceive an improvement in the instruction. The students' perceptions, however, may reflect an improvement in the administration of training rather than an improvement in the quality of training administered. If so, future research will demonstrate a decline in the magnitude of the relationship between the non-instructional variable CN and rating variances accounted for on the CEQ and its subscales (insofar as the quality of training administered remains constant).

The results of this study can be used by training managers to improve the effectiveness and efficiency of the E-3A training program.

The significant relationships between non-instructional variables CN, PREEXP, PAYGRD, AGE, DIF and CRWPST and ratings on the CEQ offer a wealth of data for training manager use. The values of the non-instructional variables PREEXP, PAYGRD and AGE, however, reflect Air Force assignment selection criteria and are therefore dependent on the qualifications of available crewmen for assignment to the E-3A program.

The qualifications of students in aircrews entering the E-3A training program subsequent to this investigation have generally been declining (Cariveau, 1978). Also, as opportunities for improvement in training program management occur (i.e., more aircraft to reduce excess time in training) training efficiency will increase. These two changes will impact many of the non-instructional variables examined in this study. The altering of student demographic characteristics and the improvement of course administration are expected to change the magnitude of the relationships between non-instructional variables and CEQ and subscale rating variance reported in this study.

The implication of changing student demographic characteristics and program maturation suggests that additional study of the relationship between non-instructional variables and student ratings of E-3A instruction is warranted. The investigator, therefore, cautions training managers against the use of the results and conclusions reported in this study without additional evidence furnished by further research. This study demonstrated the existence of certain relationships which can be useful in the design of such future research.

Recommendations

Based on the research problem addressed by this study and the

changing characteristics of the E-3A student aircrew population, parts of the investigation should be repeated. The following recommendations are made in view of the study's results and conclusions.

1. Training managers should attempt to control the excess time a student is in the training program. Better time management will reduce student discontent with training and provide more manpower for other tasks.

2. The significant though low positive correlation for the CN non-instructional variable's association with CEQ ratings should be interpreted as an indication of improved training program administration. This interpretation should continue until evidence exists that the quality of training has improved. Such evidence may be demonstrated, for example, if course ratings relating to an area of revised instruction change immediately after the inclusion of the revision.

3. There is evidence that crew positions differ in rating instruction. This difference, however, was not defined in terms of specific aircrew positions. Subsequent research should attempt to define the difference.

4. The variance of the ETHGRP and VOLTER variables was limited in this sample. Future research should investigate these variables. The ETHGRP variable, however, may provide more promising results, as evidenced by the results reported in Chapter IV.

5. When the demographic characteristics of the aircrew student population stabilize, the research problem investigated by this study should again be examined. Future research should use the results reported in this study to narrow the selection of non-instructional variables investigated.

6. A prediction equation was not reported in this investigation. Future research should therefore attempt to produce a prediction equation for student ratings on the CEQ. The large proportion of CEQ rating variance reported for the composite of all significant non-instructional variables suggests that a prediction equation will be useful to training managers in identifying changes in aircrew ratings of instruction and accounting for these changes.

7. Training managers reviewing this investigation should not generalize the research results to their training programs without additional evidence explaining student rating variance. The additional evidence should be obtained from the study of each manager's unique training program.

Summary

This investigation has examined the relationship between non-instructional variables and student ratings of E-3A aircrew training. Significant proportions of the rating variance can be attributed to non-instructional variables. That student characteristics such as age, paygrade, and previous experience account for rating variance suggest to the training manager these variables should be examined when ratings change between graduating aircrews. Situational variables such as excess time in training and crew positions also provide indicators for explaining variance in ratings of aircrew training.

The results of this investigation led to many conclusions and recommendations. The main concern of the investigator, however, was that the training manager may use the results of this study without further establishing the relationship between the significant variables

and the uniqueness of the manager's training situation. For managers of the E-3A training program, this investigation should provide guidance for additional research and the development of a prediction equation for interpreting and explaining CEQ rating variance. The end results would be the effective interpretation of CEQ ratings for improving the management and direction of the E-3A training program.

The additional research suggested by the investigator should begin when demographic characteristics of the student aircrew training population stabilize and are less subject to change. "The cycle of monitoring, modifying, and re-implementing the instructional improvement strategies is continued until a desired degree of improvement is attained" (Sheehan, 1975, p. 698).

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APPENDIXES

APPENDIX A

COURSE IMPROVEMENT QUESTIONNAIRE

552nd AWCW-TDT is conducting a survey of students completing E-3A Conversion Course training. Results of this survey will assist TD in the design and revision of each of the E-3A training programs. Please respond to each item by checking (√) or providing information requested.

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1. Name (Optional): _____
   Last First Middle

2. What is your age?
   ____1. Under 25 years.
   ____2. 25-29 years.
   ____3. 30-34 years.
   ____4. 35-39 years.
   ____5. 40 years or over.

3. How many years or active military service have you completed?
   _____ years.

4. What is your current pay grade?

____1. E-4	____7. O-1	___13. Other
____2. E-5	____8. O-2	
____3. E-6	____9. O-3	
____4. E-7	___10. O-4	
____5. E-8	___11. O-5	
____6. E-9	___12. O-6	

5. What is the current status of your promotion eligibility? (Note: For officers, refer to primary zone eligibility.)
   ____1. Not yet eligible for your next promotion consideration.
   ____2. Eligible for the first time for the next promotion board.
   ____3. First time eligible, awaiting results of the lastest promotion board.
   ____4. Eligible but not selected by the last promotion board.
   ____5. Promotion selectee.

6. What ethnic group are you a member of?
   ____1. Caucasian
   ____2. Black
   ____3. Mexican American
   ____4. Other (Specify) _____

7. What will be your crew position on the E-3A?

____1. Pilot	____7. Air Surveillance Officer
____2. Flight Engineer	____8. Air Surveillance Tech
____3. Navigator	____9. Arbn Computer Display Mtn Tech
____4. Mission Crew Commander	___10. Arbn Radar Technician
____5. Senior Weapons Director	___11. Arbn Communications Tech
____6. Weapons Director	___12. Arbn Radio Operator
	___13. Other

8. Did you volunteer for E-3A military duty?
   ____1. Yes
   ____2. No

9. What is the highest level of education you have completed?
   ____1. High School Diploma via GED.
   ____2. High School Diploma.
   ____3. Some College.
   ____4. Two-Year College Degree (e.g., AA Degree).
   ____5. Four-Year College Degree (e.g., BS, BA).
   ____6. Some Graduate Work.
   ____7. Graduate Degree (e.g., MS, MA or Higher Degree).

10. How many years of experience have you had with another weapon system where your crew duties were related to those you will perform on the E-3A? (e.g., Pilot on a KC-135, WD at a SAGE site).
   ____1. None.
   ____2. 1-5 years.
   ____3. 6-10 years.
   ____4. 11-15 years.
   ____5. 16-20 years.
   ____6. Over 20 years.

11. How would you rate your satisfaction with the overall training program?
   ____5. Highly dissatisfied.
   ____4. Dissatisfied.
   ____3. Undecided.
   ____2. Satisfied.
   ____1. Highly satisfied.

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12. CN: ____1. ____2. ____3. ____4. ____5. ____6.

13. FN GP: ____1. (FT) ____2. (MS) ____3. (MT)

14. PIS: ____1. (EL) ____2. (OF)

15. CAL DYS: ____

16. SYL DYS: ____

17. DIF: ____

PRIVACY ACT STATEMENT

1. AUTHORITY: 10 United States Code, Section B012, (Secretary of the Air Force, Powers and Duties) and Executive Order 9397 (Numbering System for Federal Accounts).

2. PRINCIPAL PURPOSE(S): Under the provisions of 552 AWACWR 50-7, the 552 AWAC/TD is conducting a survey of training for E-3A crew members. The information from this questionnaire will enable training agencies to improve training programs to to recognize superior accomplishments in either or both.

3. ROUTINE USES: Questionnaires completed by students will be compiled to provide statistical data for use by the training agencies in identification of areas needing improvement or corrective action.

4. WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION: Disclosure of this information is voluntary. If this information is not furnished, the applicable training agency may be denied data that could lead to improvement of training and facilities.

APPENDIX B

INSTRUCTIONAL SYSTEMS ANALYSIS

STUDENT QUESTIONNAIRE

1. Most of the time positional evaluation critiques helped you learn your crew position tasks better.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

2. Most of the time multi-media (sound/slide) presentation helped you develop the new skills you were to learn.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

3. Most of your instructors seemed to know their subject matter.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

4. Most of your student study guides were easy to understand.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

5. Most of the time the noise in the learning center was maintained at a minimum.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

6. Most training devices that you used helped you to better understand new concepts.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

7. Your training has prepared you to perform adequately in your crew position.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

8. Most training films used helped you learn important facts about performing your job.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

9. Most of the time the classroom presentations were hard to understand.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

10. Most of your instructors seemed interested in their subject matter.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

11. Most of the time four hours of simulator training in a training day was tiresome.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

12. Most of the time a training day having more than eight total hours of instruction became counterproductive after the eighth hour.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

13. Most of the time the instructor gave you individual help with difficult academic material.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

14. Most of the time you felt that your training was preparing you for an important role in the defense of the United States.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

15. Most classroom lectures helped you develop the new skills you were to learn.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

16. You are not looking foward to duty as an E-3A crewmember.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

17. Most of the time your instructor thoroughly demonstrated stimulator maneuvers.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

18. Most of the time the seating arrangement within your classroom allowed you to adequately see the instructor and the chalkboard.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

19. Most of the time you had to wait two or more days before you knew what your score was on a written examination.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

20. According to your instructors, most of the training films you saw were out of date by the time you saw them.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

21. Most of the time the pact of instruction within your course was fast enough to keep you from being bored.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

22. Most of the time in class you were pressed to learn material at a faster rate than you were capable.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

23. Most of the time you were motivated to work as hard as necessary to complete the course.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

24. Most of the time you were informed of the training objectives of each lesson.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

25. Most of the time there were sufficient part-task trainers in the learning center for the number of students in your class.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

26. Most written tests that you were given thoroughly covered the objectives.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

27. Most of the time the area available for individual study was quiet enough for studying.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

28. Most of the time you had enough time during class days for individual study.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

29. Most potential evaluations you were given thoroughly covered the tasks you were taught.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

30. Most of the instructor presentations were clarified by examples and illustrations.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

31. Most of the time the simulator malfunctioned during a simulator lesson.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

32. Most of the time your instructor had to supplement the training materials because he said they were not current.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

33. Most of the time in the simulator you were not given enough time to adequately learn the tasks required of you.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

34. Your training has motivated you to look forward to duty on the E-3A.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

35. Most of the time classroom temperatures were adequately maintained.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

36. Most of the time you had easy access to copies of AF regulations, manuals, technical orders and other course written materials required as supplementary reading in your course.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

37. Most of the time the simulator was not operational when scheduled for use.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

38. Most of your scores on positional evaluations reflected how well you will be able to perform your job.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

39. Most of the time the noise in your classroom was maintained at a minimum.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

40. On most course days there was enough time allowed for you to practice on part-task trainers.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

41. Most of your training materials had enough illustrations to help you learn the topics.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

42. Most of the classroom presentations were well organized.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

43. Most of your instructors motivated you to learn your job.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

44. Most of the training materials seemed related to course objectives.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

45. Most of the time you needed individual assistance to learn required tasks.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

46. Most of the time the equipment used in the classroom was appropriate for the instruction given.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

47. Most training films and slide presentations motivated you to learn the material.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

48. Most of the time class critiques of your tests helped you learn the course materials better.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

49. Most of the time your instructor gave you individual help with difficult simulator tasks.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

50. Most of the time your instructors evaded answering questions asked during class.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

51. Most of the time your training materials covered course topics in enough depth and detail.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

52. Most of the time topics within your course followed a logical sequence.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

53. Most of your classrooms were properly ventilated.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

54. Most training films helped you to better understand the subject matter.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

55. Most of the time you were not given enough time to finish your tests.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

56. Most of your instructors encouraged crew participation during simulator debriefings.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

57. Most of your scores on written tests reflected how well you will be able to perform in your crew position.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

58. Most of the time the part-task trainers in the learning center were available for your use during scheduled class periods.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

59. Most of the time chairs and tables used in your classroom were appropriate for the instruction presented.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

60. The length of your course was just right to prepare you for your job.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

61. Most of your training materials actually taught you how to perform in your crew position.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

62. Most of the time the instructors thoroughly explained new technical material.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

63. Most of the time you should have been given additional tests within each block of instruction in your course.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

64. Most of your instructors encouraged class participation during academic lessons.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

65. Most of the time your instructor referred you to material which supplemented your issued training materials.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

66. Most of the time six hours of academic class each training day was tiresome.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

67. Most of the time the chairs and tables used in your classroom were comfortable enough.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

68. Most of the time there were too many students practicing on one training device.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

69. Most of the time you did not receive a critique on a written examination within one day after the test had been administered.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

70. Most of your instructors seem to be experienced teachers.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

71. Most of the information in your training materials was up to date and accurate.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

72. Most of the time additional duties you were assigned interfered with your study.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

73. Most of the time classrooms were too small for the number of students in the class.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

74. Most of the time there were too many students using one part-task trainer in the learning center.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

75. Most of your instructors seemed to be well trained in their field.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

76. Most of the time you needed individual assistance to learn the technical material.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

77. Most of the written tests you received were easy to understand.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

78. Most of the time during flight training missions you were given sufficient time to successfully complete learning tasks.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

79. Most of the time there was enough training literature available to adequately cover the course.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

80. Most of the time during a flight training mission your instructors immediately corrected your performance errors.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

81. Most of the time multi-media (sound/slide) would have been a more effective teaching technique than the lecture/discussion.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

82. Most of the time a training flight's in-flight emergency procedures were adequately pre-briefed before the training flight was conducted.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

83. Most of the time classroom lights were bright enough.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

84. Most of the time the flight training mission scenario was accomplished as briefed.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Disagree

85. Most of the different kinds of training aids used were available for your self-study.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

86. Most of the time you were able to complete your pre-flight tasks in the time allocated prior to a flight training mission.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

87. Most of the positional evaluations you received were clearly presented to you.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

88. Most of the time collateral TAC agencies tasked to support E-3A training flights adequately supported the training flight scenario.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

89. Most of the time your instructors used new and interesting training methods to teach you course materials.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

90. Most of the time during flight training missions your instructors over controlled your learning activities.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

91. You were able to understand most of your training materials.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

92. Most of the time your instructor assisted you when you requested him.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

93. Most of the time your flight training mission check ride evaluations accurately reflected your ability.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

94. When a flight training mission received a last minute cancellation, most of your work for the remainder of the duty day was dedicated to non-training functions.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

95. You received adequate pre-mission crew rest time for most flight training missions.

(a)	(b)	(c)	(d)	(e)
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

96. Most of the time the flight training session debriefing was a useful learning experience for you.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

97. Most of the time mission planning enabled you to properly accomplish the flight training scenario.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

98. Adequate time was available for most flight training mission debriefings.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

99. Most of the time the classrooms had enough equipment for instruction.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

100. Most of the time you had easy access to part-task trainers in the learning center for extra practice during off-duty hours.

(a)	(b)	(c)	(d)	(e)
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

APPENDIX C

INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) ITEM--SUBSCALE DISTRIBUTION

TABLE XIV

INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) ITEM--SUBSCALE DISTRIBUTION

Subscale	CEQ Items	Total
Tests	1, 19, 26, 29, 38, 48, 55, 57, 63 69, 77, 87, 93	13
Crsdes	2, 9, 11, 12, 15, 21, 22, 28, 33, 36, 40, 45, 52, 60, 66, 72, 76, 78, 81, 84, 86, 88, 95, 98	24
Instper	3, 10, 13, 17, 24, 30, 42, 43, 49, 50, 56, 62, 64, 70, 75, 80, 82, 89, 90, 92, 96, 97	22
Tngmat	4, 32, 41, 44, 51, 60, 65, 71, 79, 91	10
Tngaid	6, 8, 20, 25, 31, 37, 47, 54, 58, 68, 74, 85, 100	13
Clssrm	5, 18, 27, 35, 39, 46, 53, 59, 67 73, 83, 99	12
Stumot	7, 14, 16, 23, 34, 94	6
Total		100

APPENDIX D

COURSE IMPROVEMENT QUESTIONNAIRE

RESPONSE INFORMATION

TABLE XV

COURSE IMPROVEMENT QUESTIONNAIRE
RESPONSE INFORMATION

Variable	Stimulus Item	N[1]	Mean
Age (Years)			29.6
	Under 25	5	
	25-29	31	
	30-34	36	
	35-39	18	
	40 and Over	12	
Actmil (Years)			10.6
	Under 5	8	
	5-12	63	
	13-19	18	
	20 and Over	9	
	NR[2]	4	
Paygrd			NA[3]
	E-4	5	
	E-5	25	
	E-6	7	
	E-7	9	
	E-8	2	
	E-9	0	
	O-1	1	
	O-2	5	
	O-3	33	
	O-4	10	
	O-5	4	
	O-6	0	
	Other	1	
Promot			NA
	Not Yet Eligible	38	
	First Time Eligible	16	
	Awaiting Results	2	
	Not Selected	37	
	Selectee	9	
Ethgrp			NA
	White	89	
	Black	6	
	Mexican American	2	
	Other	5	
Crwpst	(See Table II)		

TABLE XV (Continued)

Variable	Stimulus Item	N[1]	Mean
Volter			NA
	Yes	87	
	No	15	
Edlevl			NA
	GED	4	
	HS Diploma	19	
	Some College	23	
	Two Year Degree	0	
	Four Year Degree	25	
	Graduate Work	19	
	Graduate Degree	12	
Preexp (Years)			7.4
	None	17	
	1-5	52	
	6-10	17	
	11-15	11	
	16-20	3	
	Over 20	2	
Ovrsat			NA
	Highly Satisfied	0	
	Satisfied	29	
	Undecided	23	
	Dissatisfied	42	
	Highly Dissatisfied	6	
	NR	2	
CN	(See Table IV)		
FNGP	(See Table IV)		
PIS			NA
	Enlisted	51	
	Officer	51	
DIF (Days)			173
	Lowest	38	
	Highest	279	
Closed (Percent Score)			94
	Lowest	65	
	Highest	100	

TABLE XV (Continued)

Variable	Stimulus Item	N[1]	Mean
Open (Percent Score)			96
	Lowest	87	
	Highest	100	
Chckride			NA
	1	51	
	2	39	
	3	3	
	NR	9	

[1]N = number of respondents.

[2]NR = no response.

[3]NA = not applicable.

APPENDIX E

INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE ITEM RESPONSE INFORMATION

TABLE XVI

INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE
ITEM RESPONSE INFORMATION

Item Number	Response 1	2	3	4	5	NR[1]	Mean	Std. Dev.
1	2	29	21	48	1	1	3.168	0.928
2	6	25	24	42	0	5	3.052	0.972
3	0	18	19	61	4	0	3.500	0.830
4	7	23	14	58	0	0	3.206	1.018
5	0	7	11	61	16	7	3.905	0.759
6	1	17	16	62	3	3	3.495	0.850
7	4	21	23	52	2	0	3.265	0.943
8	6	31	31	27	0	7	2.832	0.919
9	2	13	20	60	5	2	3.530	0.858
10	0	14	10	67	10	1	3.723	0.826
11	6	43	17	29	2	5	2.773	1.016
12	27	51	16	6	0	2	2.010	0.813
13	2	21	9	61	8	1	3.515	0.976
14	3	22	21	50	5	1	3.317	0.969
15	1	25	21	53	1	1	3.277	0.885
16	5	7	13	49	37	1	3.851	1.052
17	11	23	13	46	2	7	3.053	1.133
18	1	2	1	83	15	0	4.069	0.567
19	2	6	1	52	41	0	4.216	0.886
20	6	20	38	22	7	9	3.043	1.010
21	8	28	4	58	3	1	3.198	1.123
22	4	14	11	55	17	1	3.663	1.042
23	1	23	8	64	5	1	3.485	0.934
24	2	8	22	57	12	1	3.683	0.859
25	13	18	22	34	7	8	3.043	1.191
26	4	21	13	60	4	0	3.382	0.985
27	2	11	15	64	7	3	3.636	0.851
28	3	21	9	61	8	0	3.490	1.002
29	3	16	19	57	5	2	3.450	0.925
30	1	17	17	63	3	1	3.495	0.844
31	17	36	15	28	3	3	2.636	1.156
32	7	40	12	39	2	2	2.890	1.072
33	7	20	13	53	7	2	3.330	1.092
34	5	32	20	39	6	0	3.088	1.063
35	2	21	5	72	2	0	3.500	0.909
36	19	30	8	42	3	0	2.804	1.243
37	1	10	24	57	7	3	3.596	0.807
38	9	30	24	36	2	1	2.921	1.046
39	0	4	6	84	8	0	3.941	0.542
40	5	28	21	38	3	7	3.063	1.019
41	2	26	13	57	2	2	3.310	0.950
42	5	30	18	47	1	1	3.089	1.001
43	5	22	20	51	3	1	3.248	0.994

TABLE XVI (Continued)

Item Number	Response 1	2	3	4	5	NR[1]	Mean	Std. Dev.
44	0	4	12	83	2	1	3.822	0.518
45	3	20	4	60	15	0	3.627	1.052
46	3	23	14	61	1	0	3.333	0.937
47	4	33	35	25	0	5	2.835	0.862
48	3	34	20	42	2	1	3.059	0.978
49	3	12	19	56	9	3	3.566	0.928
50	1	6	8	68	19	0	3.961	0.770
51	12	35	15	39	1	0	2.824	1.103
52	7	26	15	50	3	1	3.158	1.065
53	1	21	7	71	2	0	3.510	0.876
54	1	24	41	26	1	9	3.022	0.794
55	0	6	2	77	17	0	4.029	0.652
56	0	15	22	56	5	4	3.520	0.815
57	5	39	20	34	3	1	2.911	1.021
58	6	14	30	42	2	8	3.213	0.949
59	0	2	8	86	4	2	3.920	0.442
60	23	40	21	15	1	2	2.310	1.022
61	9	41	17	32	1	2	2.750	1.038
62	2	25	27	45	3	0	3.216	0.919
63	2	20	16	54	10	0	3.490	0.982
64	0	7	11	72	12	0	3.873	0.699
65	2	38	14	43	4	1	3.089	1.021
66	5	44	19	33	0	1	2.792	0.962
67	0	13	13	73	3	0	3.647	0.740
68	0	14	17	66	4	1	3.594	0.777
69	7	15	5	62	13	0	3.578	1.103
70	15	47	14	23	3	0	2.529	1.087
71	11	43	14	34	0	0	2.696	1.051
72	5	22	15	56	3	1	3.297	1.005
73	0	5	4	87	5	1	3.911	0.531
74	0	8	28	52	3	11	3.549	0.703
75	5	36	22	37	2	0	2.951	0.999
76	1	18	9	68	6	0	3.588	0.883
77	4	15	3	71	9	0	3.647	0.971
78	4	25	16	56	1	0	3.245	0.969
79	3	32	14	52	1	0	3.157	0.982
80	2	18	13	65	4	0	3.500	0.898
81	4	19	28	39	8	4	3.286	1.005
82	4	15	13	65	4	1	3.495	0.934
83	0	2	2	96	2	0	3.961	0.342
84	7	22	6	65	2	0	3.324	1.055
85	6	22	21	49	3	1	3.208	1.013
86	1	11	6	79	5	0	3.745	0.754
87	1	15	23	59	2	2	3.460	0.809
88	1	22	33	50	3	3	3.424	0.784
89	5	53	25	18	0	1	2.554	0.842

TABLE XVI (Continued)

Item Number	Response 1	2	3	4	5	NR[1]	Mean	Std. Dev.
90	2	16	15	65	4	0	3.520	0.876
91	1	7	11	80	3	0	3.755	0.667
92	0	0	6	81	15	0	4.088	0.447
93	4	11	27	50	5	5	3.423	0.911
94	14	50	18	14	1	5	2.361	0.937
95	13	3	0	77	8	1	3.634	1.111
96	6	27	16	49	4	0	3.176	1.057
97	1	10	18	65	4	4	3.622	0.767
98	0	4	8	83	7	0	3.912	0.547
99	5	24	11	59	2	1	3.255	1.059
100	7	24	31	30	1	9	2.935	0.965

[1]NR = no response.

APPENDIX F

INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SUBSCALE MEAN RATINGS AND STANDARD DEVIATIONS

TABLE XVII

INSTRUCTIONAL SYSTEMS ANALYSIS STUDENT QUESTIONNAIRE (CEQ) AND SUBSCALE MEAN RATINGS AND STANDARD DEVIATIONS

Scale	Number of Items	Mean	SD
CEQ	100	3.441	0.381
Subscales:			
Tests	13	3.497	0.503
Crsdes	24	3.325	0.416
Instper	22	3.469	0.511
Tngmat	10	3.196	0.606
Tngaid	13	3.495	0.914
Clssrm	12	3.770	0.351
Stumot	6	3.309	0.688

Note: Subscale scores were the means of the item responses. That is, Score = Item Responses/Number of Items.

VITA 2

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